PEST CONTROL

AUGUST 1961

"Ready" Time for

RODENT CONTROL

How to Mix Better Baits . . . Pg. 9
What to Do for Squirrels . . . Pg. 14
Answers to Bat Problems . . Pg. 23
Molded Anticoagulants . . . . Pg. 28
Purdue on Rats and Mice . . Pg. 31
Flawless Tile Drill Holes . . . Pg. 42
Oklahoma Spotlights PCOs . Pg. 46
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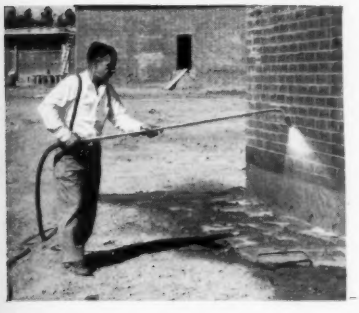

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In This Issue:

Better Baits for Rats and Mice
By Galen C. Oderkirk 9

Squirrel Problems and What to Do About Them
By John C. Jones 14

Rodent Control News Notes 22

Bats — Public Health Importance, Identification and Control
By Dr. Harold George Scott 23

Semipermanent Anticoagulant Baits
By Rex E. Marsh and Lloyd F. Plesse 28

A Correspondence Course in Pest Control Technology
Lesson 8: Rats and Mice 31

NPCA Convention News 40

Krupnick Uses Portable Plumber's Heater When Drilling Asphalt Tile Holes 42

Parade, Proclamations, TV, Radio, Newspapers, Herald Statewide Oklahoma Pest Control Week 46

Make Every Sales Call Worthwhile
Notebook by J. Earl Griffin 66

Regular Features:

Letters 5
News 52
Calendar 60
Infestation Report 70
Classifieds 72
Advertisers 72
Pestales 74

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Killing Bugs Isn't All

Most pest controllers are in business to make money, and to do so they naturally have to know how to keep insects and rodents supressed. But that isn't all. The proper placement of chemicals requires an investment in men, equipment, and plant, as well as efficient management of sales, personnel, and overhead. A successful pest control firm is one with *profit* control as well.

There seem to be different standards for government operation of business services and for those run by private individuals. Monopolistic practices and price fixing are naughty, naughty procedures forbidden by law, except when federal economists decide, for example, to raise postage rates 25 or more percent across the land. No court will haul the Post Office Department in for violation of anti-trust laws. So, with such limitations on the action an industry can take as a whole to stabilize prices, or raise them to keep pace with increasing costs, each businessman has to keep control of his profits by holding costs down.

Emphasis at university conferences is on pest control technology. This is as it should be, for there expert researchers hunt for scientific improvements in the ways we do things. Annual conventions of the National Pest Control Association have become increasingly devoted to the business side of pest control. This year's meeting at Miami Beach will devote the major part of two days to improving the fiscal administration of a firm's activity. The University of Illinois' School of Business Management has been putting on a conference for PCOs since 1950 and attendance has been increasing at each session. As competition increases, the need to be educated in better business practices becomes more acute.

No, this is not a business for any Tom, Dick, or former serviceman to set up shop on his own. A keen, trained sense of business management is just as important as adequate experience in pest control technology.

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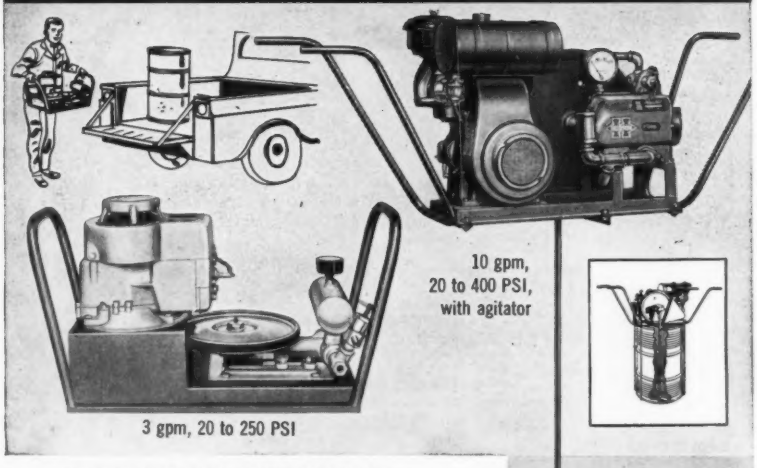

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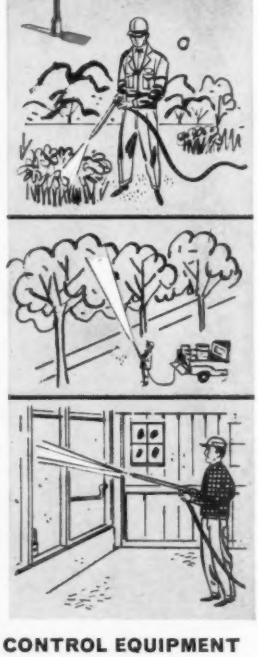

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Letters

Topsy-turvy Picture

I am convinced that the editorial staff of *Pest Control* is suffering from vertigo; that is, you are flying upside down. However, since this is a topsy-turvy business, it really makes no difference that the picture is upside down on page 54 of your June issue in which you report on how we removed bees from a wall void. You've pictured the ceiling on the floor, the plaster laps are flowing upward, and the bees are working in reverse.

Incidentally, I find that I reported in error to you that we used 20% DDT dust to eliminate the bees after the honey was cleaned out. Just for the record, I believe it was only 10%.

Charles D. Cushing

Manager
Vogel-Ritt, Inc.
Philadelphia, Pa.

Fumol Is Manufacturer

Will you kindly note that the company which made the cockroach repellent mentioned in my article, "Keeping German Cockroaches Out of Beer Cases," which begins on page 32 in your June issue, is the Fumol Corporation of Long Island City 1, New York.

Arnold Mallis

Gulf Research & Development Co.
Pittsburgh, Pa.

Grammar, or Artist's License

Editor's Note: We're sure many of our good readers will have noticed that the word "fumigation" on the front cover of last month's issue was broken FUM-IGA-TION and that this is the incorrect way to break this word. We had a tussel with our art director, who said, "I know it! I know it! But it *looks* better broken that way. It gives better artistic balance." We gave in to artistic license, knowing full well that Webster breaks the word fu-mi-ga-tion.

Pest Control welcomes expressions of opinions from its readers. Send ideas and comments briefly as possible to James A. Nelson, Editor, Pest Control, 1900 Euclid Ave. Cleveland 15, Ohio.

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Better Baits

FOR RATS AND MICE*

By **GALEN C. ODERKIRK,** Animal Control Biologist, U. S. Dept. of the Interior, Branch of Predator & Rodent Control, Lafayette, Ind.

SUCCESSFUL control of rats and mice with poison baits hinges on the use of attractive food, properly prepared and carefully placed.

The use of attractive foods is obviously essential, but even the best of foods can be rendered ineffective by lack of thought and care in mixing the ingredients. For example, when one ounce of poison is recommended, the quantity used should be exactly one ounce. This amount has been worked out for the purpose of obtaining maximum kill with the mimimum of taste or odor influence on acceptance. The fellow who feels that adding an extra bit of poison to really "knock 'em out" is only kidding himself. That "extra bit" of poison may mean the difference between good or poor acceptance, particularly in dealing with infestations that are highly selective in their choice of foods. In addition, it increases the hazard to other animals, as well as adding to the cost of the bait.

On the other hand, a bait mixture containing less than the recommended amount of poison may produce many bellyaches but few kills. Rats are leery of food that has made them sick and the resulting bait shyness is a hard problem to overcome. Thus, "a pinch of this and a pinch of that" may have worked alright for Aunt Mary's pie recipe but it won't get the job done in mixing an effective bait.

Hunger is the impelling motive behind the movement of rats from their burrows to open places. Their initial hunger may be partly satisfied by a small amount of unpoisoned food found in places where they are accustomed to feed. From that point on, a poisoned bait must have equal or more appeal than the available unpoisoned food. It is, therefore, important to use high quality and fresh food materials. It is false economy to use a food merely because it is "cheap."

Avoid Contaminating Tastes and Odors

One should be careful to avoid contaminating tastes and odors when handling and storing foods. Oils and smelly chemicals get spilled, maybe not directly on bait foods but close enough for them to absorb disagreeable tastes and odors. Some foods lose their flavor after being stored a while. Cracked corn or partially degerminated corn meal is a good example. In time it loses part of its appealing corn odor and flavor. Therefore, when using corn meal containing part or all of the germ, it would be best to mix fresh bait frequently rather than to make up enough to last for several months.

Cold storage is very useful for holding perishable food baits. Flavor loss is retarded but odd flavors may be absorbed from other material stored in a catch-all refrigerator. It therefore pays to keep the refrigerator clean or store the food bait in tight containers. If thin polyethylene bags are used, keep in mind that oils and gases may move through the film. The rate of movement apparently is governed mainly by temperature and density of the film. Bait foods or prepared baits normally are protected very well in polyethylene film if the storage space is cold but be careful if the temperature is high.

Choice Rat Food

Let us consider further the food ingredients of a poisoned bait. We will assume that the bait proportions were determined largely by the trial and error method rather than by means of tests with rats and mice such as we have done. If a person were to put together a bait material by merely combining certain foods known to be eaten by rats, it is probable that the bait would be accepted by hungry rats

Bait testing houses in Lafayette, Indiana, where tests were run to discover the preference of wild rats for rodent baits made up of varying ingredients.

*Based upon an address presented at the Purdue University Pest Control Operators Conference, February 3, 1961.

but not so where it competes with tasty foods. For that reason it is usually best to develop a formulation based on food acceptance tests in which rats and mice have let you know their preferences. For example, we tested 4 corn meal samples from different millers, 3 of which were the same kind. Acceptance by wild rats was as follows:

Table 1

	Test 1	Test 2
Corn Meal (A)	944.5 gms.	847 gms.
Corn Meal (B)	277.5 gms.	
Corn Meal (C)		30 gms.
Brewers Grits (D)	91.5 gms.	140 gms.

When rats indicate to you that they have such a definite preference for one brand of corn meal over another, it is likely that they will show a similar preference when it becomes a constituent of a bait formulation. Therefore, a test of this kind would suggest not only that Corn Meal A should be used but that an effort be made to learn why it is better than the others. Food purchases should then be made on the basis of quality rather than cost. It goes without saying that if extreme care is observed in determining and maintaining the quality of each ingredient, the quality of the finished bait will be kept on a high level.

We learned the preference of rats and mice for certain foods and food combinations by a testing procedure that allows the animals a choice of 3 food baits. In this way we found (Table 2) that they liked a combination (Test 1) of corn meal 60%, oats 30%, sugar 5%, and crude corn oil 5%.

When we eliminated the oats and substituted corn meal (Test 2) there was an appreciable drop in the food intake. When the corn meal was eliminated in favor of oats (Test 3) there was an even greater drop in acceptance. It was obvious from these tests that they actually preferred the corn meal-oats mixture to a food bait containing only corn or oats. With this indication that they like a combination of corn meal and oats, in another series we introduced various other foods. In this one (Table 3) we added powdered buttermilk to the mixture.

Note the almost complete refusal to accept the corn meal-oats combination containing 40% powdered buttermilk and the slight increase in acceptance as the quantity of buttermilk powder is reduced.

A similar pattern followed in the tests with powdered skim milk (Table 4).

In this series, there is more consistent dislike of the food mixture containing a high proportion of skim milk powder. Acceptance picks up as the skim milk powder is reduced.

Now let us take a look at the results obtained when we take a food bait mixture (Table 2 — Test 1), bringing together varying amounts of food additives such as lecithin and peanut meal (Table 5).

Note the drop in acceptance when lecithin and peanut meal are substituted for corn oil. When we increased the amount of peanut meal in the formulation it failed to make an appreciable change in acceptance, but there was a noticeable response when a part of of the corn oil was restored to the mixture.

In the development of a dry red squill bait, we checked on the value of many flavors and tasty materials with the idea of masking the bitter taste of red squill. Anise oil was one. It has been used as an attractant in baits by pest control operators for many years. Invariably it has been used in such large amounts that it probably acted as a repellent rather than as an attractant. After some tests, we determined that 1 drop of oil of anise to 1,000 grams of food bait actually helped improve the acceptance of our red squill bait mixture. In our search for a masking flavor we found that garlic powder in very small amounts also improved acceptance of the squill bait.

These are but a few of the many food acceptance tests we have con-

Table 2

	Test 1	Test 2	Test 3
Corn Meal	60%	90%	—
Steel Cut Oats	30%	—	90%
Confectioners Sugar	5%	5%	5%
Corn Oil	5%	5%	5%
Gms/animal/day	12.9	8.6	5.3

Table 3

	Test 1	Test 2	Test 3	Test 4	Test 5
Corn Meal	50%	30%	35%	40%	45%
Steel Cut Oats	50%	30%	35%	40%	45%
Powdered Buttermilk	—	40%	30%	20%	10%
Gms/animal/day	16.4	.7	1.4	—	—
Gms/animal/day	14.2	—	.67	2.9	—
Gms/animal/day	15.4	—	—	2.7	3.2

Table 4

	Test 1	Test 2	Test 3	Test 4	Test 5
Corn Meal	50%	30%	35%	40%	45%
Steel Cut Oats	50%	30%	35%	40%	45%
Powdered Skim Milk	—	40%	30%	20%	10%
Gms/animal/day	21.1	.36	.39	—	—
Gms/animal/day	25.6	—	.23	.26	—
Gms/animal/day	26.0	—	—	.14	2.3

Table 5

	Test 1	Test 2	Test 3	Test 4	Test 5
Corn Meal	60%	59%	58.5%	57.5%	57.5%
Steel Cut Oats	30%	29%	28.5%	27.5%	27.5%
Powdered Sugar	5%	5%	5%	5%	5%
Peanut Meal	—	6%	6%	10%	7%
Crude Corn Oil	5%	—	—	—	3%
Lecithin	—	1%	2%	—	—
Gms/animal/day	15.1	2.5	2.9	4.2	9.1

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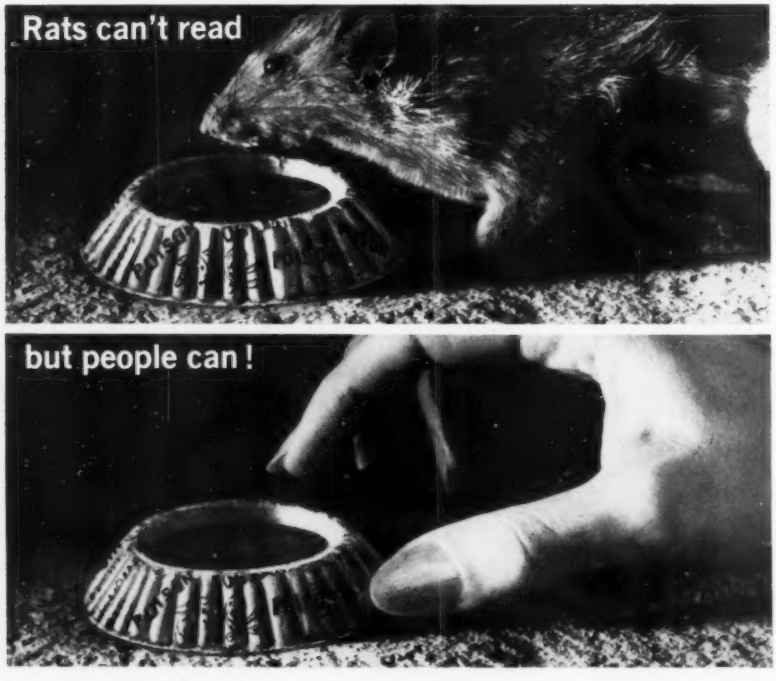
ducted. What significance can be attached to the results? Were the tests conducted in such a manner that firm conclusions can be reached concerning the value of certain foods in baits? We do not have the answers to these questions but we believe that the results are typical of what would be found on a typical farm in this area with its abundance of corn, oats, other cereal grains, and livestock feeds. Can we take data accumulated in Indiana tests and apply it to eastern and southern states? Again, we do not have the answers. In the South for example some formulators seem to think that rats prefer crude peanut oil to crude corn oil.**

The fact that the flavor or odor of a food is pleasing to humans does not necessarily mean that rats and mice will react the same way and take it readily. Determination of food preferences of rats and mice is a tedious task, but we feel that it is the proper approach to the development of bait formulations. Although a great many food combinations have been tested, we feel that there is still much to learn about food and liquid preferences of rats and mice. Only by continued studies will it be possible to provide the best bait tools to cope with the varied problem in the control of rats and mice.



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5. Pyrrole Chemical Corp., 817 Spring Lane, Portsmouth, Ohio
6. Hub States Chemical & Equipment Co., 1225 North Windsor St., Indianapolis 1, Indiana

Publications *to write for...*

Here are the latest government, university and association publications of interest to pest control operators. Some can be obtained free of charge, while others are nominally priced. When ordering, include title and catalog number, if any. Sources follow booklet titles.

Pesticide Residues in Meat and Milk. Booklet No. ARS-33-63. 46 p. December, 1960. Agricultural Research Service, U.S. Department of Agriculture, Washington 25, D.C.

Preliminary Evaluation of Lindane and Heptachlor Crystals for Protection of Crated Furniture Against Insect Damage. 1p. October, 1960. Stored Product Insects Laboratory, U.S. Department of Agriculture, Savannah, Ga.

The Effectiveness of Sevin-Sesamex Combinations Against Adult Flour Beetles (*Tribolium spp.*). 1p. October, 1960. Stored Products Insects Laboratory, U.S. Department of Agriculture, Savannah, Ga.

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Your Wool-Eating Guests. Leaf. No. 52. Agricultural Publications, 207 University Hall, 2200 University Ave., Berkeley 4, Calif.

Insecticidal Equipment for the Control of Insects of Public Health Importance. Catalog No. FS 2.60/7:In 7.29 p. il. 1960. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. 25c.

** Mr. Oderkirk says: "The purpose of this discussion is to point out the factors influencing the acceptance and results with poisoned baits. The data are from experiments conducted at Purdue University. Operators should make tests of bait foods and formulations to determine their acceptability locally."

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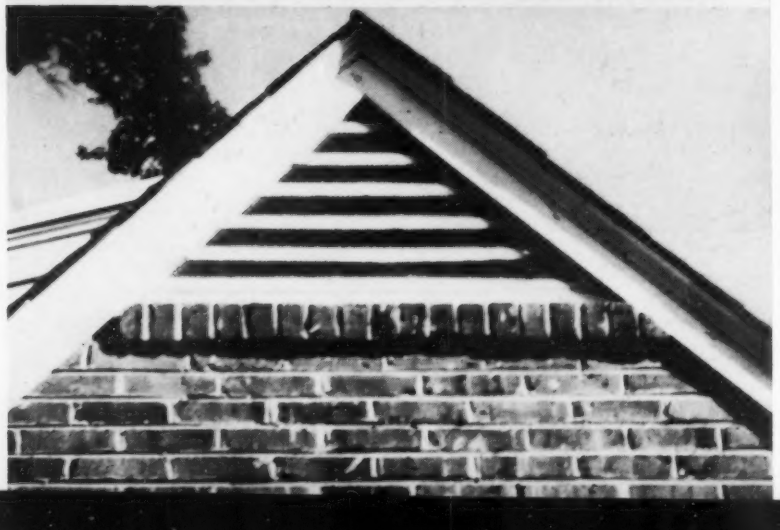
Innocent-looking gray squirrel photographed at work by E. P. Haddon in Washington, D. C.

Squirrel Problems

AND WHAT TO DO ABOUT THEM

By **JOHN C. JONES,** Staff Specialist, Branch of Predator and Rodent Control, Bureau of Sport Fisheries and Wildlife, Washington, D. C.

Note gnawings and smear marks in lower right-hand corner of louvre vent, shown in this picture, where gray squirrels have enterred house to attack its contents. In the picture below, we see the same attic entrance closed with heavy gauge metal. Woodwork is completely covered to prevent gnawing.



NATIVE rodents, present in America before man, have generally welcomed the human invader and prospered with him. A few could not stand the competition, but most found his activities more of a help than a hinderance. They burrow in his fields, feed avidly on his crops, and gnaw happily on the products of his labors. For some, man has actually improved the habitat and today they are more numerous and widespread then ever before. Most rodents stay out of sight or avoid close personal contact with man.

Not so with gray squirrels. Hunted in their natural habitat, they are shy and difficult to approach, but in cities and suburban areas, where they are protected, they become remarkably tame and fearless. They are so well adapted to man's way of life that they even establish their nests in his homes. Being animals, they must eat. Being rodents, they must gnaw, to keep their incisors worn down. The results range from minor annoyances to their human hosts to major damage and costly repairs.

Much of the blame for such troubles lies with man himself. Squirrels have been released in parks, provided nest boxes, and fed. To the average city dweller, who rarely sees any wild animal, they are particularly appealing little creatures and their presence is generally considered a public asset. Since the animals respond and thrive under these conditions, it is to be expected that when natural shelters are filled, the excess progeny must move to find new quarters. When enough food is not provided, squirrels must forage for themselves. And they gnaw.

Similarly, in suburban developments, where houses replace woodlots, the new residents attract squirrels with food and encourage them to remain. With nest trees removed, attics offer excellent substitutes. If they have been attracted to the house with food, it is to be expected that they may remain for shelter.

The list of damage is long, ranging from digging in lawns, through cutting on nearly everything that grows, sticks up or hangs down, to structural damage to houses and exposed utilities. Lead cables are favored honing strops, while the

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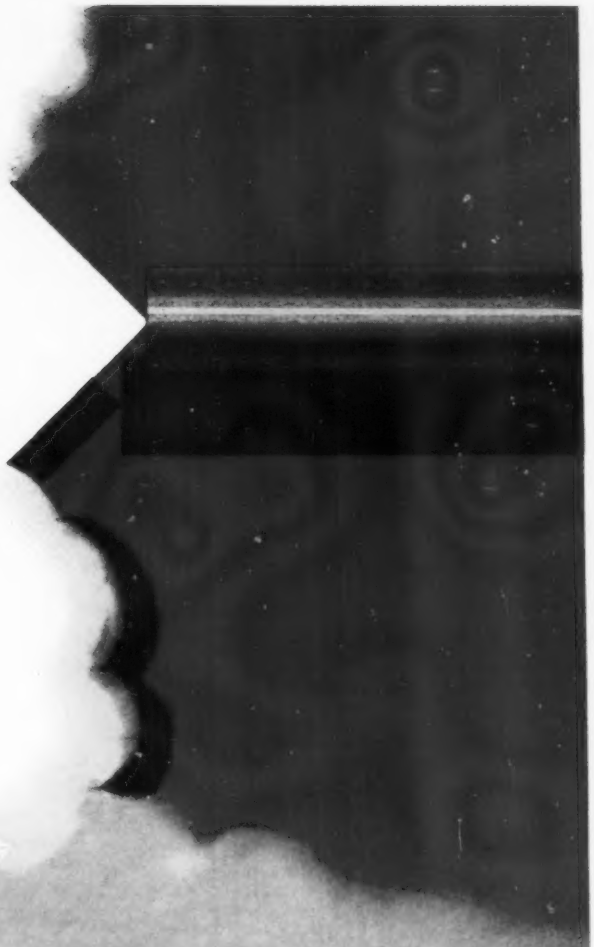

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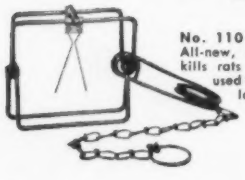

No. 110 Victor Conibear All-new, body-gripping trap kills rats instantly. May be used with or without bait. Ideal for ground and rafter sets.

coaxial lead-ins from television antennas apparently antagonize, for they are frequently ripped to shreds and replacements suffer the same fate or worse. At this point the offending creatures undergo a remarkably quick transformation from pets to pests, and the anguished householder wants action, but quickly.

Pest control operators should keep this background in mind when receiving a frantic call for assistance. Good public relations demand at least sympathy and a few intelligent suggestions if service is not to be provided. Actually, many PCOs have found it quite profitable to handle squirrel problems where houses have been invaded, particularly since most complaints come from late fall through early spring when other work may have slackened. Few care to tackle outdoor problems, mostly because of the amount of personal service involved, but where the customer is willing to underwrite the expense, there are a number of approaches that are practical and within the scope of average pest control service. Proofing, repellents, removal, and reduction offer a variety of choices which, blended with patience and a little attention to the reasons for the problem, should provide a satisfactory solution. In selecting a technique, remember that gray squirrels are game animals in most States and are protected in many municipal areas. Determine what regulations apply and comply with them.

Proofing

Squirrel proofing involves much the same techniques that are applied in rat proofing, except more so. The major difference lies in the fact that most of it is done after the fact, since prevention is rarely anticipated.

Keep in mind that most squirrels take a dim view of being evicted or blocked from a warm, comfortable home and will make every effort to circumvent roadblocks. Sheet metal and hardware cloth or expanded metal are the most useful materials, and are effective if properly installed. In buildings, particular attention should be given to the entry site. Attic louvres and vents are probably the most common entrance, although squirrels will not hesitate to cut their own openings underneath the eaves in a convenient spot. Poor fitting sheathing or cracks may encourage gnawing. When closing those openings, make certain that any wood in the immediate vicinity is also covered.

A baseboard or trim under the eaves that has been cut through may need to be covered for three feet or more each side of the entrance, or even for the entire side of the house.

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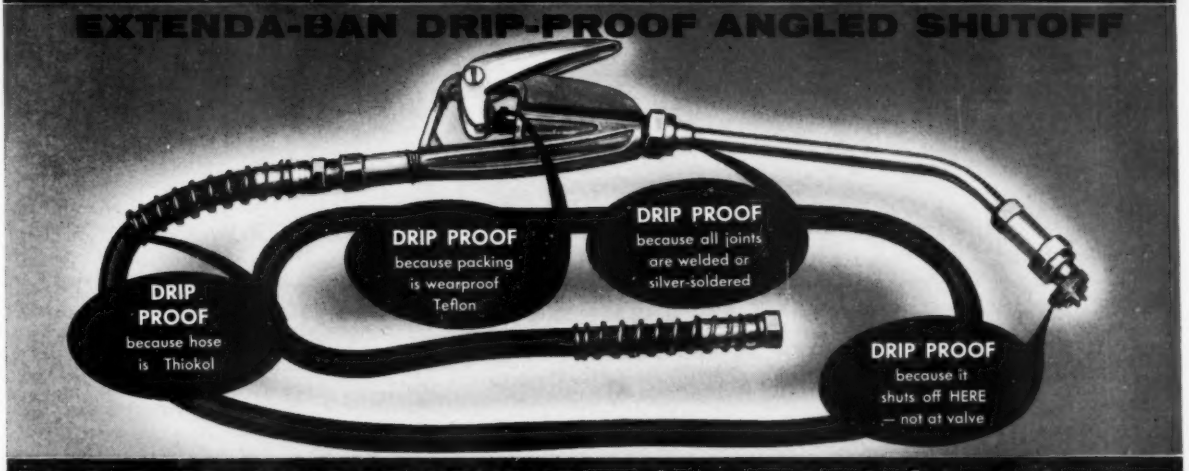
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covering the louvre, but should be applied on the outside, not the inside, and all the wood covered if the homeowner is to be spared widespread, even if futile, gnawing. Better still, replace an old wooden louvre with one of aluminum and back it up with hardware cloth or expanded metal on the inside where it will be invisible.

Before closing, a building entrance, it is essential to remove any unwanted tenants. This may be done by driving them out with repellents or by trapping. Paradichlorobenzene crystals and naphthalene flakes have long been recommended for this purpose, particularly in small enclosed areas. Some PCOs have had success using fogging apparatus and a strong odorant such as pentachlorophenol or ammonia for quicker results. If tried, follow safety procedures including masks, protective clothing, evacuation of occupants, and provisions for ventilation.

Another precaution — squirrels enter attics to build a nest. Sometimes these may be three feet or more in diameter. Young are likely to be present, and a squirrel will not hesitate to attack if cornered or to protect the young. And squirrels can bite! Be prepared to defend against such an attack.

The nest may well be heavily infested with fleas or mites. It should be treated thoroughly with insecticide and removed — after the occupants are successfully dislodged.

The chimney is another common entry and it should always receive attention, even if it has not been used. A basket of hardware cloth effectively closes it, leaves ample air movement, and also prevents birds from entering. There have been a number of instances where squirrels have entered a closed house through a chimney and wreaked havoc with furnishings and woodwork while the lawful occupants were away.

Proofing also has some value out-of-doors. Thin wall conduit or pipe can be used to shield the television lead. Hardware cloth can make a temporary cover to stop digging for bulbs in flower beds or to protect individual small shrubs. A 2-foot band of sheet metal around the trunk of a tree can stop squirrels from using it, provided it is set 6 feet from the ground and there is no other route of entry (there usually is!). Remember that squirrels are persistent. Having once gained an objective, they will try dilligently to return despite barriers.

Repellents

Chemical repellents can provide a variety of services. Most disappointments are due to expecting more than they are able to perform. The use of strong irritants to drive squirrels from enclosed spaces has been mentioned. These dissipate quickly in open air and are used to provide temporary relief, giving time for more permanent methods to be adopted. Some sticky substances, such as some of the recently developed chemicals that are applied to bird roosting sites, may discourage climbing to some extent and might be preferable to a metal band to protect a solitary fruit or nut tree, even if repeated applications are necessary.

A number of materials have been suggested to prevent gnawing on wood surfaces. Repellent paints containing asphalt emulsion

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and copper carbonate, and wood preservatives with copper naphthanate or zinc naphthanate have long been recommended. The black or green color of the first two is often objectionable to a homeowner, the last named is less noticeable. One method is to treat the surface and, if no further squirrel activity takes place, paint to match the area to the rest of the house. Use a paint compatible with the repellent, or pre-treat first to prevent the stain from bleeding through later.

Feeding activity is more difficult to stop. A repellent usually is effective in direct proportion to the pressure upon the animal to feed. In the case of rodents, this is further complicated by their ability to cut through an outer covering without ingesting the material.

Shrubs, flowers, and garden plants can sometimes be protected for a short time with a spray of nicotine sulfate, lysol, or even epsom salts. The newer deer and rabbit repellents, including ZAC, TMTD and TNBA,[1] are sometimes more effective. They tend to wash off with rain, although some formulations of the latter include excellent adhesives. All must be repeated to cover new growth. Comply with the manufacturer's directions as to safe use on dormant and growing plants and on fruits or vegetables intended for human consumption.

Removal

One simple solution to a squirrel problem is to remove the culprit from the scene of the crime. Admittedly, there are a few complications to this proposition, not the least of which may be a singular lack of cooperation on the part of the squirrel. Actually, live trapping is not too difficult. Frequently, this is the best solution for protection of flower beds. From the PCO's point of view, however, the time and personal effort involved looks prohibitive at first.

Several interesting possibilities present themselves, again largely from the standpoint of providing a customer service that may result in other opportunities or better public relations. Traps can be rented, loaned, or sold, with the customer providing the labor. There are several manufacturers of live traps suitable for catching squirrels, but there are few local outlets, particularly in larger metropolitan areas. A ready source of supply could easily be a real community service. Or, if the customer is willing to engage that much service — and some are — place a properly baited trap in the right location and even return on call to remove captured animals.

Squirrels usually follow fairly regular travel routes. Nut meats, peanuts, peanut butter, rolled oats, or large seeds like pumkin or sunflower, all make good baits. If the householder has been feeding the squirrels, that material should be highly effective. Set the trap facing the travelway or in the area where they have been used to feeding. It can also be used in an attic that has been invaded. A light sprinkling of rolled oats outside

1. ZAC = zinc dimethyldithiocarbomate-cyclohexylamine
   TMTD = tetramethylthiuramdisulfide
   TNBA = trinitrobenzine-aniline complex

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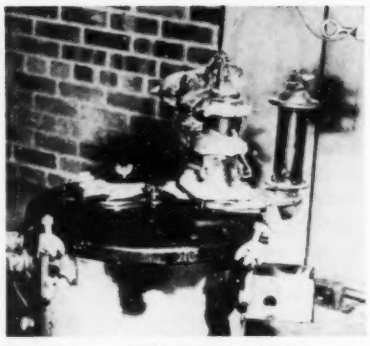
the entrance to the trap is usually helpful. Once caught, the squirrel should be taken to a rural area for release, where it will be an asset instead of a liability. Consult the local game warden for the best sites, or make arrangements with the nearest fish and game or conservation organization. They may be glad to have the animals. Be sure the place is at least 20 miles away from the point of capture to avoid returns, and be sure to comply with game regulations.

Reduction

When other methods fail or are impractical, more drastic measures may be necessary. Shooting, where and when legal, can often be recommended but is rarely applicable to pest control services. Indoors, a .22 caliber rifle, using shot shells, is highly effective at close range and can be used, with discretion, in an attic space without harm to the building structure (beware of stored antiques!).

Trapping is the method of choice. These should be placed directly in regular travelways. No. 0 and No. 1 steel traps will hold gray squirrels satisfactorily. Staple or fasten the chain securely. Since they merely hold the animal, the squirrel should be removed promptly to avoid needless suffering; in most cases it can be removed and released, as its dignity is its major injury. The ordinary wooden base rat trap is an effective weapon that will catch and kill all but the largest gray squirrels. Enlarge the trigger with a square of cardboard and nail the trap in place. Smear a little peanut butter on the center of the cardboard, or, if the trap is on the level, sprinkle a little rolled oats on the trigger. The newer scissors-type traps, like the connibear or the bigelow, are also lethal. They work well when set over an entrance hole. Use steel or snap traps only in protected places, preferably indoors, where other animals will not contact them.



Burned-out transformer ruined when gray squirrel grounded the unit by gnawing through a polyethylene covering on its insulator.

Poisons are not ordinarily recommended for squirrel control. In summer cabins, a generous supply of an acceptable anticoagulant-type bait is a good protection against all rodents and may be useful if squirrels cut their way in during the owner's absence. In most homes and occupied buildings, however, squirrels will generally occupy spaces that are difficult to reach. Poisoned animals are likely to die in inaccessible places and cause a king-size odor problem. Nut meats, the most attractive bait, are also attractive to young children. Never use them where there is the remotest possibility that children may gain access to them. Outdoors, bait exposures should be made only in protected wooden stations like those used for rats. Squirrels are often reluctant

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to enter such boxes and may take several weeks to get used to them.

By now it should be fairly obvious that squirrel control is largely a matter of persistence and ingenuity. The need and demand is increasing steadily in most sections of the country, particularly in the newer suburban areas and adjacent to urban parks. Providing this service can be a challenge to any PCO and even, perhaps, profitable.

Rodent Control News Notes

Newest rat toxicant, not available commercially in this country, is a systemic called Tetramine. Known technically as tetramethylene disulphotetramine ($C_4H_8N_4O_4S_2$), it's patented by Germany's Farbenfabriken Bayer (U.S. Patent No. 2,650,186) and is being used experimentally by our government in a Pacific Northwest reforestation program as a systemic poison to be absorbed by plants upon which field rodents feed. One expert says Tetramine is 1,000 times as toxic as 1080 and that its manufacturer has not only limited the length of time laborers can work on it, but also has difficulty getting employees to make it at all.

Bait formulators, once bitter opponents to government sponsored bait-mixing operations, are now said to be complaining because extension service demonstrations and sample give-away programs have virtually ceased. Rodenticide sales perked up in areas where government agents sold anticoagulant baits at low prices and demonstrated their proper usage. Onlookers learned how to place rodenticides properly, went out and bought more because government "handout" worked so well. Pressure from commercial bait makers brought the program to a halt. Federal agents no longer mix rat poisons, PC was told. Now an increasing number of reports of anticoagulant failures are reported to be coming to district agents because users don't know how to use the stuff. Manufacturers, too, are complaining. Their sales have dropped off since there is no organized effort to stimulate rodent control with baits like the ones they want to sell.

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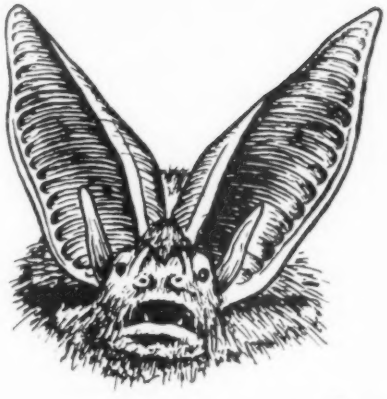
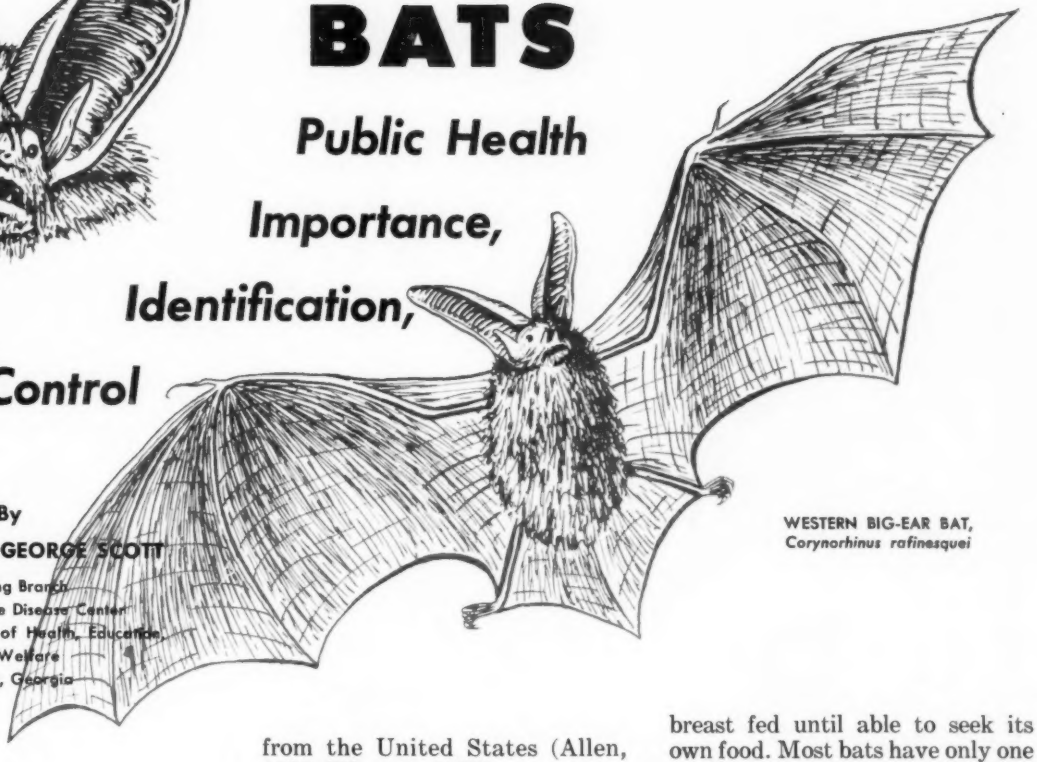


BATS

Public Health Importance, Identification, and Control

By
DR. HAROLD GEORGE SCOTT
Training Branch
Communicable Disease Center
U. S. Department of Health, Education, and Welfare
Atlanta, Georgia



WESTERN BIG-EAR BAT,
Corynorhinus rafinesquei

BATS, the only mammals with the power of true flight, probably originated in the Old World Tropics. They are now nearly distributed world-wide, being among the most numerous of land vertebrates. Bats are related to the hedgehog, mole, shrew, and "flying lemur."

They range in adult wingspan from 8 to 60 inches ("flying fox" of Java). Their wings consist of the fingers of the hand greatly elongated to support the membranous wing surface. Bats navigate by means of a sonar-like echo-location which enables them to avoid objects readily, even in total darkness. Flight protects them from predatory land animals, while their nocturnal habits generally keep them from predatory birds.

Most bats are insect-eaters, but some eat fruit, nectar, pollen, smaller bats, birds, and fish. A few species found in South and Central America drink blood, but blood-drinking bats are not known from the United States (Allen, 1939; Wimsatt, 1957).

Folklore and Historical Aspects

Bats were closely associated with witchcraft in Europe. They were envoys of the Devil, and vampires (souls of the dead seeking the blood of the living). Mixed into "potions" they cured the sick, imparted alertness, improved nightsight, and sealed curses. Even today many people throughout the world believe that bats will entangle themselves in the long hair of women. In China they were symbols of rare luck and good times. To many American Indians they were powerful deities.

Historically, bats are best known for the part they played in the discovery of Carlsbad Caverns, New Mexico, by James Larkin White who investigated a cloud of "smoke" on the desert and found it to be hundreds of thousands of bats emerging from the Caverns.

Life History

Bats give live-birth to a single young after a gestation period of 2-8 months. The baby, about one-third the weight of the mother, is breast fed until able to seek its own food. Most bats have only one young per year (spring or fall), but some species have two or more. Some female bats store the male sperm from fall matings for spring fertilization.

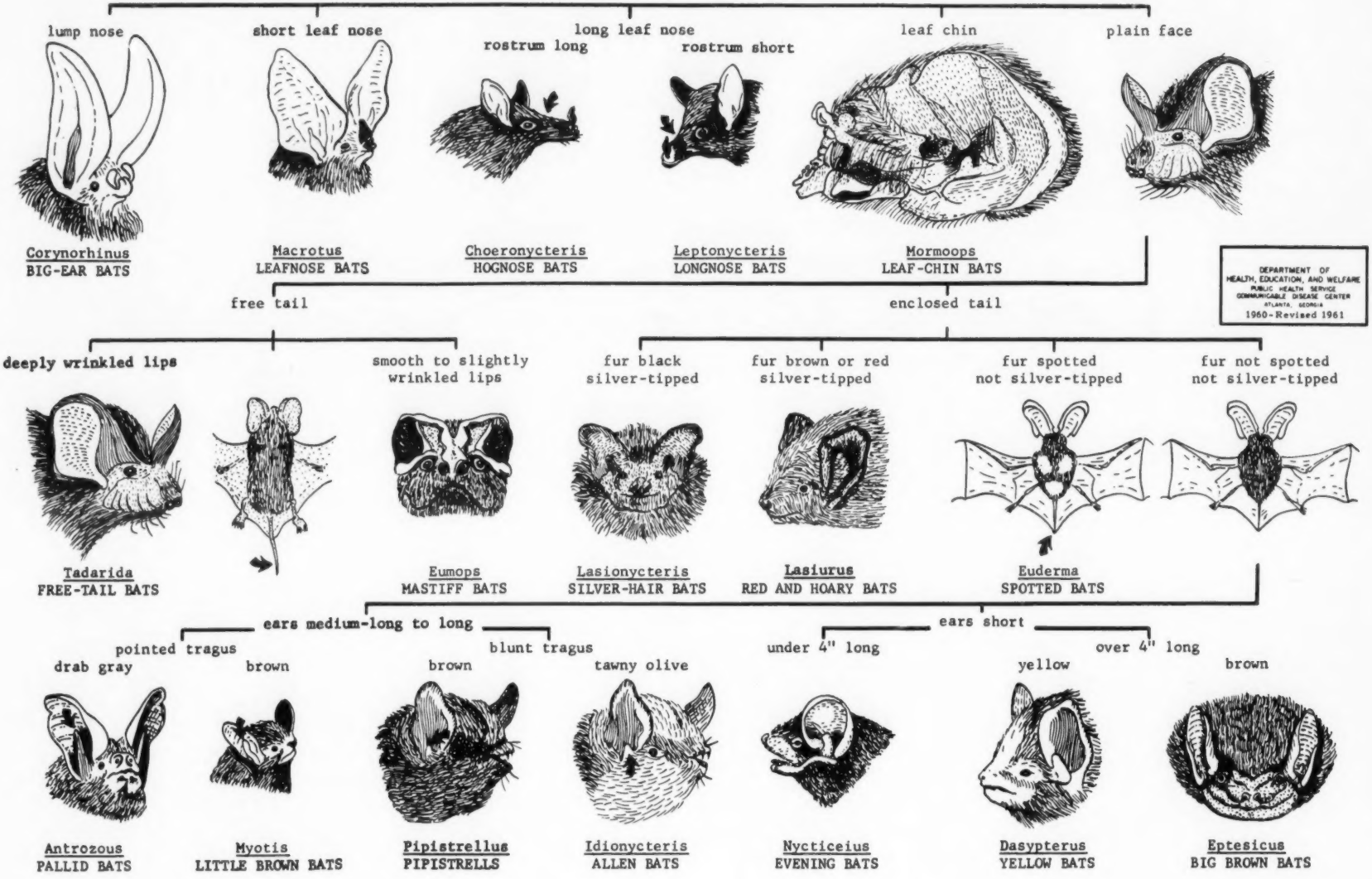
Because of their small size and high metabolic rate, bats are very sensitive to cold. Most species hibernate in constant temperature caves or migrate to warm climates in the winter. When bats sleep, even during the summer, their body temperature rises and falls with the temperature of the outside air. Individual bats may live over 20 years (Constantine, 1958).

Beneficial Aspects

Bats eat large numbers of insects and thus keep potential pests in check. Bat guano (manure), an excellent fertilizer, is mined from bat caves. Emergence of bat swarms from caverns or large buildings is one of the most dramatic sights on earth. Experimental work with bats is yielding important scientific information in such fields as zoogeography, systematic zoology, geriatrics, and gynecology. Bats pollinate a number of plants

BATS: PICTORIAL KEY TO UNITED STATES GENERA

Harold George Scott, Ph.D.



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1960-Revised 1961

(Pijl, 1956), and bring about dispersal of others (Pijl, 1957).

Economic Problem

Bats infesting buildings produce offensive odors and distracting noises. Their droppings deface structures and equipment. Some damage fruit and other agricultural products.

Public Health Problem

Blood-drinking bats may *bite* domestic animals and rarely man.

Bat Ectoparasites, ticks (Arthur, 1956; Hoogstraal, 1958), mites (White, 1960; Woodroffe, 1956; Yunker, 1958), fleas (Krutzsch, 1955; Ricci, 1954), and bat bed bugs may attack man, especially when bats infest a house (Pratt, 1958). Flies may breed in bat roosts (Assis-Fonseca, 1958). However, the primary public health significance of bats is due to their association with several important communicable diseases.

Rabies, a highly fatal virus disease of man and other mammals, is transmitted from animal to animal by infected bites. Rabies is most commonly associated with dogs and other carnivores in human experience, but bats may carry the disease in nature (Courter, 1954; Reagan, *et al.*, 1954; Enright, 1956). Derriengue, a modified rabies transmitted by blood-drinking bats, causes great loss of livestock in Latin America.

Japanese "B" Encephalitis, a virus disease of birds and mammals including man, is transmitted from animal to animal by mosquitoes. Bats are suspected of being one overwintering mechanism of this disease (LaMotte, 1958).

Histoplasmosis, a systemic fungus disease of man, may be contracted by inhalation of dusty bat manure containing *Histoplasma capsulatum*. Bats do not transmit histoplasmosis, but dusty bat manure is a suitable medium for development of air-borne spores of the fungus (Emmons, 1958).

Dermatomycoses, fungus infections of the human skin, are usually transmitted by contact from man to man or from domestic animal to man. However, *Trichophyton mentagrophytes* (causing barber's itch, athelete's foot, ringworm) and *Microsporum gypseum* (causing ringworm of the scalp, favus) are associated with bat caves, and bats possibly serve as significant reservoirs of these fungi (Lurie and Way, 1958).

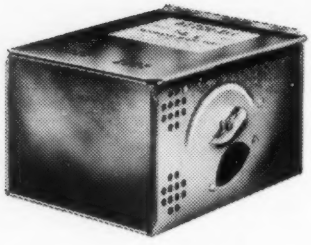
The Relapsing Fevers of man and other animals, caused by spirochetes of the genus *Borrelia*, are transmitted from man to man by soft ticks. Many vertebrates, including bats, serve as reservoirs from these diseases, but the relationship of bats to the maintenance of the human relapsing fevers remains to be investigated.

Leptospirosis, an acute systemic spirochaetal disease of man and many other animals including bats, is transmitted from animal to animal and to man via contact with infected urine. Bats are probably of minor importance in the transmission of this disease to man except among persons handling bats or living in bat-infested buildings.

Chagas Disease, a protozoal sleeping sickness of man and other mammals caused by *Trypanosoma cruzi*, is transmitted from infected animals to man by blood-sucking

Distribution of Bats in the United States

COMMON NAME	SPECIES	DISTRIBUTION
Pallid Bat	*Antrozous pallidus*	Western U. S.
Hognose Bat	*Choeronycteris mexicanus*	Arizona and California
Eastern Big-Ear Bat	*Corynorhinus macrotis*	Southeastern U. S.
Western Big-Ear Bat	*Corynorhinus rafinesquei*	Western and Central Midwestern U. S.
Western Yellow Bat	*Dasypterus ega*	California
Yellow Bat	*Dasypterus floridanus*	Gulf Coast and Florida
Yellow Bat	*Dasypterus intermedius*	Gulf Coast and Florida
Big Brown Bats	*Eptesicus fuscus*	All U. S.
Spotted Bat	*Euderma maculata*	Western U. S.
Florida Mastiff Bat	*Eumops glaucinus*	Florida
Western Mastiff Bat	*Eumops perotis*	California
Allen Bat	*Idionycteris phyllotis*	Arizona and Northern Mexico
Silver Hair Bat	*Lasionycteris noctivagans*	All U. S. Except Deep Southeast
Red Bat	*Lasiurus borealis*	Eastern Two-thirds U. S. plus California and Arizona
Hoary Bat	*Lasiurus cinereus*	All U. S.
Seminole Bat	*Lasiurus seminolus*	Gulf Coast
Longnose Bat	*Leptonycteris nivalis*	Arizona and Texas
Leafnose Bat	*Macrotus californicus*	Arizona, Nevada, and California
Leafchin Bat	*Mormoops megalophylla*	Extreme Southeastern U. S.
Mississippi Myotis	*Myotis austroriparius*	Mississippi Valley and Southeastern U. S.
California Myotis	*Myotis californicus*	Western U. S.
Long-Ear Myotis	*Myotis evotis*	Western U. S.
Gray Myotis	*Myotis grisescens*	Northeastern and Central U. S.
Keen Myotis	*Myotis keeni*	Northeastern U. S. and Northwest Coast
Little Brown Myotis	*Myotis lucifugus*	Most of U. S.
Arizona Myotis	*Myotis occultus*	Southwestern U. S.
Indiana Myotis	*Myotis sodalis*	Northeastern and Midwestern U. S.
Small Foot Myotis	*Myotis subulatus*	Western and Northeastern U. S.
Fringe Tail Myotis	*Myotis thysanodes*	Western U. S.
Cave Myotis	*Myotis velifer*	Southwestern U. S.
Long Leg Myotis	*Myotis volans*	Western U. S.
Yuma Myotis	*Myotis yummanensis*	Western U. S.
Evening Bat	*Nycticeius humeralis*	Eastern U. S.
Western Pipistrel	*Pipistrellus hesperus*	Western U. S.
Eastern Pipistrel	*Pipistrellus subflavus*	Eastern U. S.
Florida Freetail Bat	*Tadarida cynocephala*	Gulf Coast
Pocketed Freetail Bat	*Tadarida femorosacca*	Arizona and California
Mexican Freetail Bat	*Tadarida mexicana*	Western U. S.
Big Freetail Bat	*Tadarida molossa*	Texas



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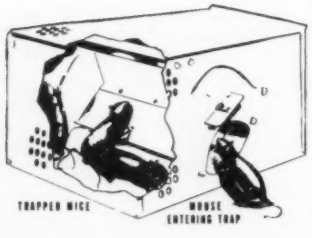

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bugs. Bats possibly may be one of the reservoirs of this disease, but are probably of minor importance in this respect.

United States Species of Bats

Most genera of U. S. bats contain only one, two or three species. *Tadarida* contains 4 species, *Myotis* has 13. Using the pictorial key plus distributional data, it is almost always possible to determine species of bats encountered in pest control operations, and to then seek out, in scientific literature, habits and other information useful in control (Sanborn, 1954).

Bat Control

Before undertaking bat control, public health personnel should determine what degree of protection is afforded these animals by *state and local fish and game laws*. In addition, bats form a "nocturnal line of resistance" against insects and reduction of bat populations might result in increased insect-borne disease and agricultural problems.

Personal Protection. Never handle bats, especially if they appear sick. If bitten, report to a physician at once. Personnel engaged in control or research work involving bats should be immunized against rabies. Where blood-drinking bats are common, install window and door screens and use mosquito bed nets.

Bat-Proofing is the most satisfactory method of control in houses (Cope, 1959). Walls, roofs, and floors should have no openings larger than ⅜-inch diameter. Roosts on the outside of buildings should be eliminated. Completion of proofing should find all of the bats trapped outside. Close all but a few main entrances, wait four days to accustom the bats to leaving by these; then, at evening after all the bats have swarmed out, close the remaining openings. The structure should be checked for several evenings. If bats are present, the remaining openings must be found and closed. Bat-proofing is best done in early spring and fall. At other times young bats may accumulate on the ground near roosts or be trapped inside to decay and produce odor.

Repellents may be effective in keeping bats out of a building. Paradichlorobenzene and naphthalene (moth flakes), sticky and chemical bird repellents, and rodent repellents are used. Glass fiber insulation blown into spaces occupied by bats will repel them.

Bat Killing, even when safe and legal, gives only temporary relief and is generally unwise.

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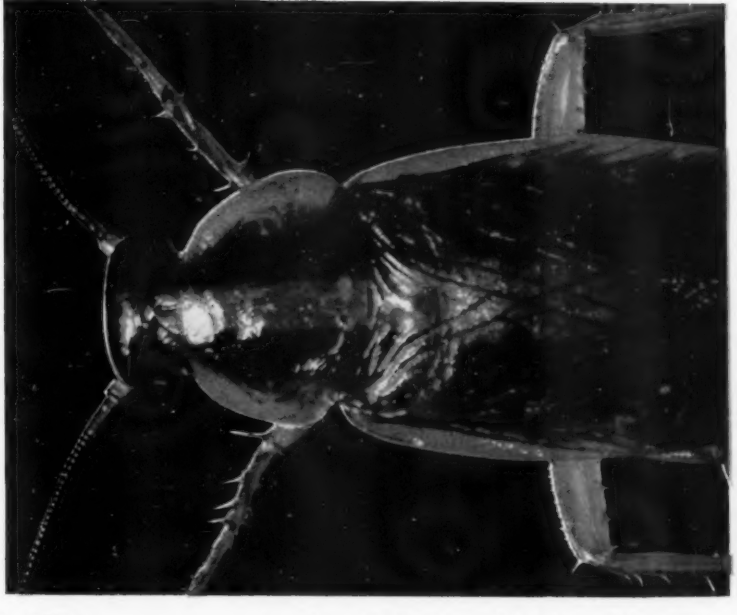

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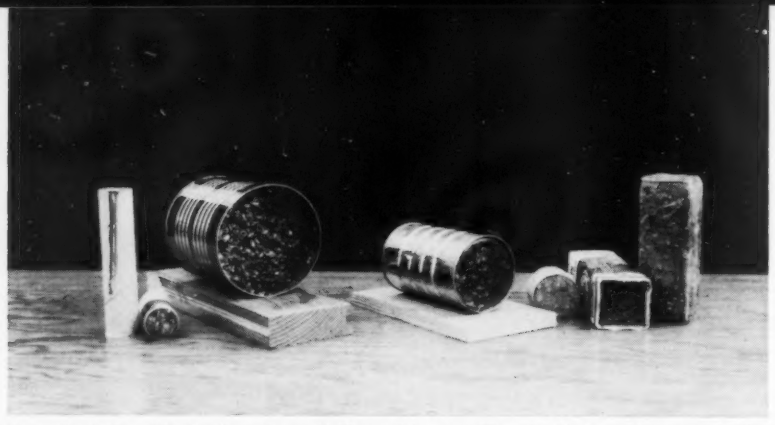

Forms for bait molds. Cardboard cores (left) containing paraffin embedded warfarin treated rolled barley. One gallon paraffin bait station next is used for sewer rat control. At far right are cardboard tubes and milk carton molds suitable for gopher control.

SEMIPERMANENT *Anticoagulant Baits*

By **REX E. MARSH,** Rodent & Weed Control Asst., California Dept. of Agriculture

LLOYD F. PLESSE, Deputy Agricultural Commissioner, Santa Clara County

ANTICOAGULANT rodenticides developed in recent years have become widely accepted and extensively used in rat and mouse control. Relatively slow in action, anticoagulants require multiple feedings to bring about death by depleting the coagulating factors of the blood, thus causing internal hemorrhaging. Anticoagulants obviously have a safety margin not available in other materials.

Need for Semipermanent Baits

In areas of high humidity and excessive moisture, treated grain baits often become damp, caked or moldy rendering them unacceptable to rodents. Because of this there exists a need for a formulation which will remain effective for long periods under adverse conditions. Incorporating anticoagulant treated grain bait in melted paraffin appears to be a solution to this problem. Coating of such baits with substances to make them impervious to moisture, though not a new concept in rodent control, has not been extensively applied to anticoagulants in California.

Four years ago at the suggestion of Lloyd Plesse, Deputy Agricultural Commissioner of Santa Clara County, paraffin coated baits were prepared to control Norway rats in sewers, where dampness is a major problem. Preliminary trials in the City of Santa Clara resulted in satisfactory control with these coated baits. Additional trials were later conducted which also gave satisfactory acceptance and control. Based on these results the Cities of Santa Clara, Los Gatos, and Sunnyvale are now using paraffin coated anticoagulant baits to control rats within their sewer systems.

Two-pound block of paraffin and warfarin treated rolled wheat is left exposed permanently in building where rat reinfestation is likely to occur.

Bait Preparation

Anticoagulant treated bait materials are prepared by the standard mixing procedure, using any grain which has been predetermined to be acceptable to the rodents. Blocks of paraffin are melted in a double boiler type of container using a water bath. The treated material is then stirred into the melted paraffin in sufficient quantity to provide a thick but flowable mixture. This paraffin bait is then poured into containers and allowed to cool and solidify. Waxed milk cartons and one-gallon cans, both with tops removed, have proved satisfactory. Various sizes can be used according to the particular need or availability.

The ratio of grain bait varies from 1 to 1½ pounds to 1 pound of paraffin, according to the type of grain used.

Rat Control in Sewers

For rat control in sewers, 1 gallon cans of anticoagulant paraffin bait are placed on their sides and toe nailed to a length of board. A wire is attached to the bait container which is then placed on the apron of the manhole. The other end of the wire is then secured to a top ladder rung or other convenient anchor point. This permits easy placement, inspection, and re-

(Continued on page 58)

Paraffin embedded baits being placed in gopher runways in a school playing field. Note mold from small diameter core is just right for such usage.

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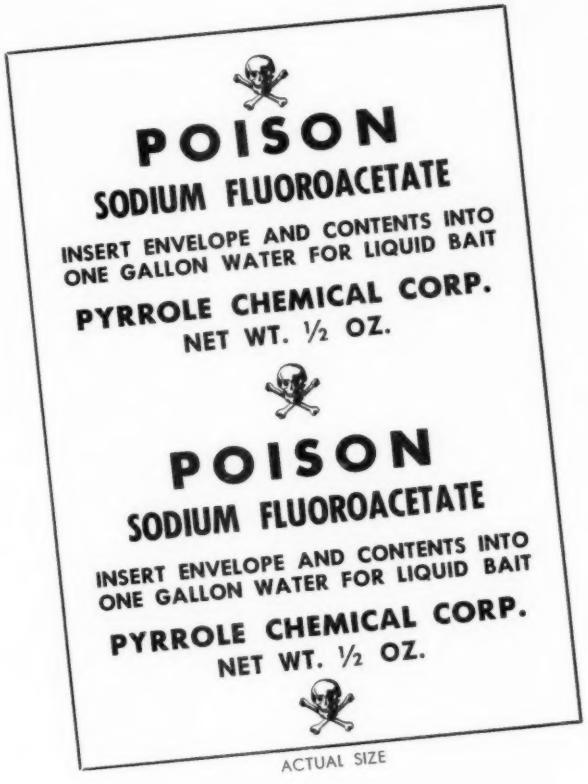
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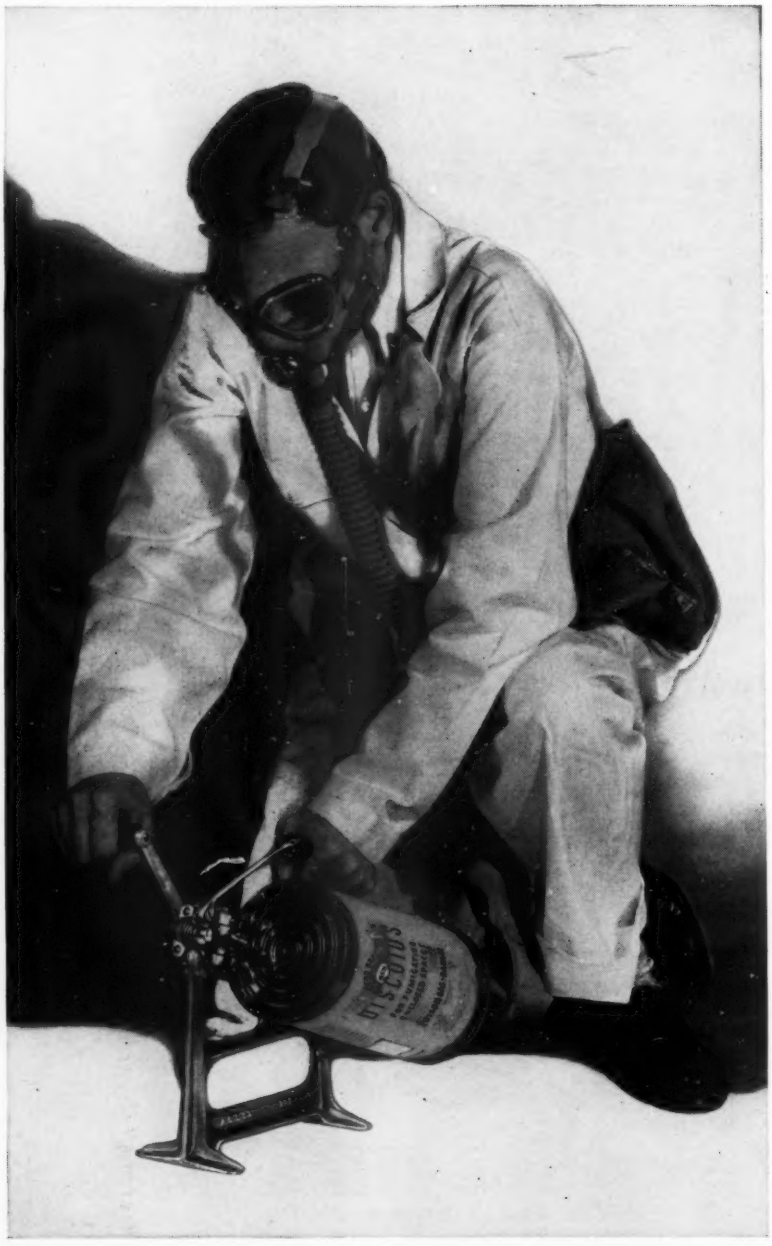

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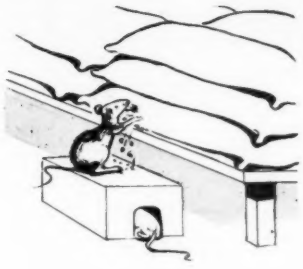

PURDUE UNIVERSITY, DEPARTMENT OF ENTOMOLOGY, WEST LAFAYETTE, INDIANA

Correspondence Course in Pest Control Technology

By DR. LEE C. TRUMAN*

Lesson No. 8

Rats and Mice

Order Rodentia, Family Muridae

RATS AND MICE have been among the most persistent and damaging pests of man since the dawn of history. Being very adaptable in their habits, they live in close association with man wherever he may be but still remain wild and undomesticated.

RATS

Rats are extremely important pests. On the farm they eat and contaminate all kinds of stored products, eat many crops in the field, destroy fowl, eggs, and wildlife, and damage farm buildings. In stores and warehouses they damage merchandise, destroy food, damage furniture and contaminate food products. They often bite sleeping children and even adults.

RATS AS DISEASE CARRIERS

Rats are especially harmful to man and domestic animals as carriers of disease. Plague in its various forms has been spread by rats and infected fleas from rats for thousands of years. Plague is the "Black Death" which killed more than 25,000,000 people in Europe in the 14th Century. Millions of lives are still being lost in many countries of Asia. Plague epidemics have occurred in various portions of the United States since 1900. This disease is spread particularly by the black rat and its flea, *Xenopsylla cheopis* (Rothschild).

Murine typhus is spread by the lice, fleas, and mites of rats; infectious jaundice (Weil's disease) is spread by a bacterium in the blood and urine of infected rats; rat bite fever is frequently contracted after humans are bitten by a rat; trichinosis is caused by a minute worm found in the intestine of the rat; and acute food poisoning can result from eating food that has been contaminated with rat excreta. Rats also carry the organisms of poliomyelitis (infantile paralysis), typhoid, dysentery, and rabies. All of these diseases can be transmitted by other means, but the rat is an important potential carrier.

HABITS OF RATS

Rats are very adaptable in their habits and have no set pattern of behavior. As environmental conditions change, they modify their habits accordingly.

Roof rats are expert climbers and commonly occupy the higher portions of buildings, yet they may be found in sewers.

Norway rats prefer to live in burrows in the ground, but they often live under conditions favored by roof rats.

Rat activity is most evident at night although when undisturbed or when very hungry rats move about and feed in the daytime.

Nesting Places

Hiding places of rats are usually well protected. They are chosen to give the rat protection from its enemies. Nests, in which they produce their young, are built of almost any soft material, which is chewed, or otherwise separated, into small bits to make a loosely matted mass. Young rats in a nest are protected by the female until they are able to fend for themselves. Both the male and the female will frequently eat the young. The reason for this is not known, but is probably due to a dietary deficiency in the adults. Outdoors, the nesting places may be in burrows in the ground or tangles of tree limbs, trash dumps, or piles of rubbish. Indoors, nests will be found in wall voids, underneath floors next to the ground, or in undisturbed rubbish or stored materials.

Senses

Rats have rather poor vision but their senses of smell, taste, hearing, and touch are quite highly developed. They react to new objects placed in their paths of travel. Suspicion of new objects appears to become more highly developed as rats mature. They prefer to run next to walls or other surfaces which they touch with their vibrissae, or whiskers, as they run. Although they are easily frightened by sudden or unusual sounds, they are often quite active in noisy locations.

Good Jumpers, Climbers

Rats are good jumpers and climbers. Some can jump as high as 2 or 3 feet and when cornered can jump downward for much greater distances without apparent harm. They can climb rough walls, pipes, wires, rods, and other surfaces on which they can obtain a grasping hold, and can easily travel along as small a path as a single electric wire stretched horizontally.

All species of rats and house mice may live together in the same building but normally one species will predominate.

Few Natural Enemies

Domestic rats have few natural enemies in most places where they choose to live, consequently, natural enemies are unable to keep a rat population under control. On farms, hawks and owls may kill some rats, but they can only capture those which get out into the open and are not very effective in keeping the population under control in and around farm buildings. Weasels, skunks, and some snakes will also kill

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FIELD IDENTIFICATION OF DOMESTIC RODENTS

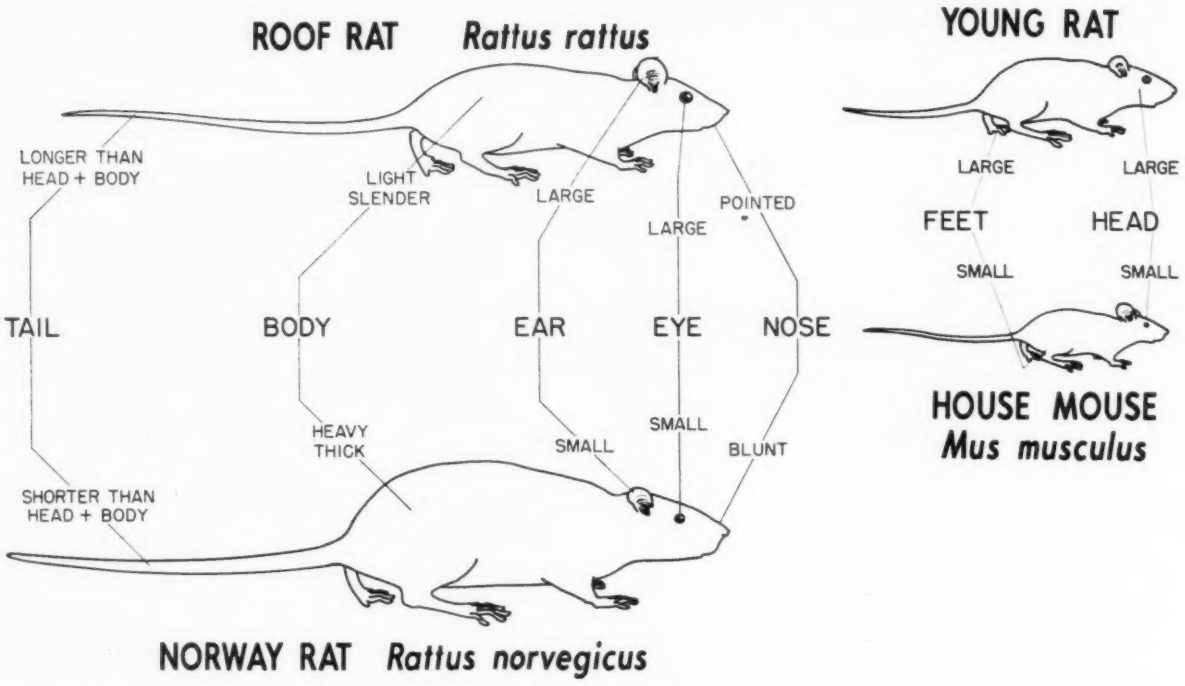


Figure 8-A. This key should be of value to help identify the most common pest rodents which the PCO is likely to encounter. The relative length of the tail and body should be considered first when attempting to identify the adults. The relative size of the ears compared to the size of the body is a rather distinctive characteristic which can usually be observed without much difficulty. The other characteristics tend to be somewhat more subtle, and should be used with caution. To distinguish between young rats and adult mice, the relative size of the feet and the rest of the body is generally a distinct and easily recognizable characteristic. (All illustrations used in this Lesson, except 8-C, 8-G, and 8-M, are reproduced through the courtesy of the U. S. Public Health Service, Communicable Disease Center, Atlanta, Goergia.)

rats. Cats and dogs kill rats but usually only the immature ones. A full grown rat is a very difficult adversary for a cat or a small dog. They are too large to get into the rat's burrow so they can catch only those that are out in the open.

RAT SPECIES

Four species of introduced rats are present in the United States: the Norway rat, *Rattus norvegicus* (Berkenhout), and three sub-species of *Rattus rattus* Linnaeus known as (1) black rat, (2) Alexandrine or roof rat, and (3) the white-bellied rat.

NORWAY RAT

Rattus norvegicus (Berkenhout)

This rat is also known as the house rat, brown rat, wharf rat, sewer rat, water rat, and gray rat. It is the most widely-distributed species in the United States, being found in all states. It is larger bodied and stronger than the other species hence, when it invades an area, it may easily force another species out. It can be distinguished by its heavy, thick-set body, small, close-set ears, and the fact that its tail is shorter than its head and body together. See Figure 8-A.

The Norway rat will frequently nest outdoors in underground burrows even when there are many suitable nesting places in adjacent buildings. They are frequently found burrowing in railroad embankments, along stream banks, under chicken houses and corn cribs, and in and under piles of rubbish. Rats that live outdoors will seek food outside if it is available. However they will enter buildings for food at night and return to their burrows after feeding. Some may nest and spend their entire lives inside a building.

Norway rats prefer to travel over flat surfaces but they will climb stairways, pipes, wires, and rough walls when necessary to get into a building or to find food and water.

The Norway rat prefers food with a high carbohydrate and protein content although it will eat almost any available food. Livestock feed, fresh fruits and vegetables, meat, sugar, bulbs of flowers, corn, flour, wheat, beans, bread, and even injured rats may be eaten.

Norway rats do not usually have a life span of much more than 6 to 12 months in nature. In captivity they may live for 3 or more years. Disease, weather, and other hazards tend to keep them from living this long under natural conditions. The young may reach sexual maturity in as little as 2½ months (but normally about 4 months are required), and they can breed as often as once each month thereafter. A female may produce 2 to 20 young. A yearly average would be 3 to 6 litters each containing 6 to 8 young. The young are naked and blind at birth. Their eyes open on the 14th day after birth and they are weaned during the 4th week. The number of litters and the number of young in each are largely dependent upon such factors as the food supply, age and condition of the female, competition and temperature.

The Norway rat is apparently stronger and better

adapted to produce young and survive in colder climates than are other species.

BLACK RAT

The term "black rat" includes a group of rats all of which are sub-species of *Rattus rattus*. *Rattus rattus rattus* Linnaeus is known as the black rat or ship rat; *R. r. alexandrinus* (Geoffroy-St. Hilaire),

Figure 8-B. The roof rat, *Rattus rattus* Linnaeus. Note long tail and ears which are features that distinguish it from the Norway rat.

the roof rat, grey-bellied rat, or Alexandrine rat; *R. r. frugivorus* (Rafinesque), the white-bellied or roof rat. The colors of each of these rats vary considerably and the color of certain individuals of one sub-species may overlap that of another, hence color is not a good characteristic to follow in their identification. As a group, they can be easily separated from the Norway rat by reference to Figure 8-A and Figure 8-B.

Black and roof rats are most commonly found in seaports in the southern parts of the United States. They are commonly called "ship rats" because they infest ships. They are common in Gulf seaports. Though excellent climbers that frequently build their nests in vines and trees, they may nest in underground burrows, inside buildings, and under piles of rubbish. Their climbing ability and choice of the upper parts of buildings make it possible for them to live and thrive in the same areas as the Norway rat.

This group of rats prefers such foods as seeds, fresh vegetables or fruits, potatoes, wheat, and corn, although, like the Norway rat, they will eat almost anything that is available when necessary.

RAT CONTROL

The first part of any good rat control job consists of determining just where the rats are living, feeding, and traveling, and the extent of the infestation.

You must look closely for signs that indicate the presence of rats. Areas underneath and around the foundations of buildings, around refuse piles, along railroad tracks and embankments, and under materials stored outdoors should be examined closely for the presence of rats. Burrow openings are usually easily seen, and where they are being used, will be relatively clean with hard-packed earth where the rats move in and out of them. See Figure 8-C.

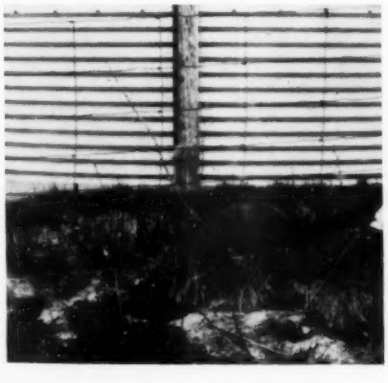


Figure 8-C.

A number of rat burrows in an area adjacent to a building. Note the smoothness of the openings of the burrows, indicating rather frequent entries and departures.

Figure 8-D. A well-defined rat runway found beneath a building. Such runways are present in many areas which are infested with rats and are guideposts to proper placement of traps and poison baits.

Figure 8-E. Smears on the beam beneath each joist were made by the oils from the hair of rats as they travelled along the beam by swinging around the joists. This is good indication of the pattern of rat movement in such situations.

SIGNS OF INFESTATION

Because rats tend to move over regular routes, they produce more or less well-defined runways. See Figure 8-D. Outside, these runways may be distinguished by the soil surface which will be smooth, well packed, and free of vegetation. Inside, they will show the same characteristics in unexcavated areas under buildings and in areas where heavy dust, flour, or other materials are on the floor. Where runways are in otherwise clean areas inside, grease from the rats' fur will show where they have been running close to surfaces. These may occur around the bottoms of joists where rats are traveling along beams or sill plates (See Figure 8-E), on stairways which they travel frequently, or around openings where they go through doors and walls and other similar places.

Look closely for rat droppings; they are evidence of the presence of rats. The freshness of droppings should be checked closely because old droppings may

Figure 8-F. Rat tracks as seen in dust. Note the length of this set of tracks.

remain in an area long after a rat infestation has been eliminated. Fresh droppings are soft and moist while old ones are usually dried and hard. When looking for rat infestations in homes, do not mistake the droppings of squirrels for those of rats. Rat droppings are usually about 3 times as long as wide with blunt ends, whereas those of squirrels are only about 1½ times as long as wide with more pointed ends.

Rat tracks are easily seen where there is dust of any kind present. See Figure 8-F. Prints of the 5-toed *hind* feet and the 4-toed *front* feet are frequently both present. In addition a large rat frequently leaves marks where its tail has dragged over a dusty surface. Fresh tracks will be sharp and clear, while old tracks will usually be partially obscured by a layer of dust.

Figure 8-G

A door which has been gnawed through by a rat. This is a common point of entry for rats. An effective means of rat-proofing in such situations is shown in Figure 8-H.

Another clear sign of the presence of rats is the presence of gnawed holes through a building, or in products within it. See Figure 8-G. Old rat holes in building walls will be smooth, whereas new ones will frequently have rough edges and splinters projecting from them. When they gnaw into food containers, rats will usually tear much larger openings than are necessary to get at the contents and will usually contaminate a great deal more of the product than they consume.

Urine stains left by rats may be observed in areas which they frequent. Some pest control operators, particularly those who do work in large food factories and warehouses, use an ultra-violet lamp to look for rodent urine. The urine usually shows up clearly with a fluorescent color in the light of such a lamp.

The presence of live or dead rats, the odor of rats, nests, and caches of food stored by rats, are other signs of an active infestation.

When you find any of these signs in abundance, you can assume there is a heavy rat population present. Where signs are few, and not fresh, the population is light.

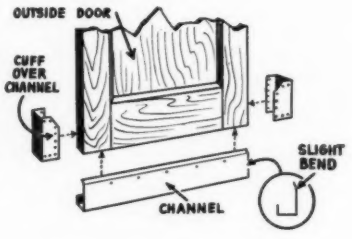
On any premises, a satisfactory rat control program consists of 4 essential steps: elimination of shelter for the rats, elimination of their food and water supply, rat-proofing the structure, and killing the rats. Any of these factors may be a greater or lesser part of any job. Some of them may be impractical or unnecessary. You should check each when you are planning your work so as not to overlook any part that needs to be done.

ELIMINATING SHELTERS

In all areas, rubbish piles must be eliminated. Where it is necessary to accumulate refuse, it should be kept in rat-proof containers until it is removed from the premises. All materials should be stored 1 foot or more away from walls on pallets. Grass, weeds, and other vegetation near buildings should be kept closely cut. These measures will reduce the places where rats can hide and will also reduce their food supply.

Figure 8-H

Exploded view of cuff and channel assembly used for rat-proofing doors. Before placing the assembly on the bottom of a door, clearance between the door and the doorsill must be reduced to not more than one-fourth of an inch.



RAT-PROOFING

In many buildings rat control is impossible because the construction of the building permits rats to get in faster than they can be killed. In such cases, it is necessary either to accept a lesser degree of control than is normally desirable, or to rat-proof the structure to allow adequate control. In the normal course of commercial pest control work it is not always possible to do extensive rat-proofing. You should, however, see that enough rat-proofing is done so your baiting program will have a chance to succeed.

One of the principal places of entry for rats is underneath exterior doors which do not fit closely to the floor. The bottoms and edges of these doors can be built up with wood so there is no opening greater than ½-inch and then covered with a metal cuff as shown in Figure 8-H. Where wood door jambs are susceptible to gnawing by rats, they can also be covered with sheet metal.

In openings such as windows, coal chutes, ventilating fans, and foundation vents, rat-proofing can be done by tightly covering the opening with hardware cloth with openings not larger than ½ inch.

Holes through wooden walls can likewise be covered with hardware cloth or sheet metal, while holes through masonry walls should be cemented shut.

Pipes and wires running up outside walls should be protected with metal guards as shown in Figure 8-I.

Foundation walls can be protected with an offset curtain wall of either concrete, metal, or asbestos board as shown in Figure 8-J. While rats may frequently burrow deeper than 2 feet, the offset at the bottom of a wall will keep them from burrowing around the curtain wall. This type of construction can be adapted to any type of foundation whether the inside ground level is above or below grade.

It is impossible to list every conceivable condition where rat-proofing may be necessary. Your best tool when you do rat-proofing is your own thinking ability. Every possible route of rat access to the building must be considered. A judicious use of sheet metal, hardware cloth, and concrete will usually give the desired result.

POISON AND TRAP PHASE

After having considered and made use of the three preceding methods of control to the fullest practicable extent, the remainder of a rat control job must be

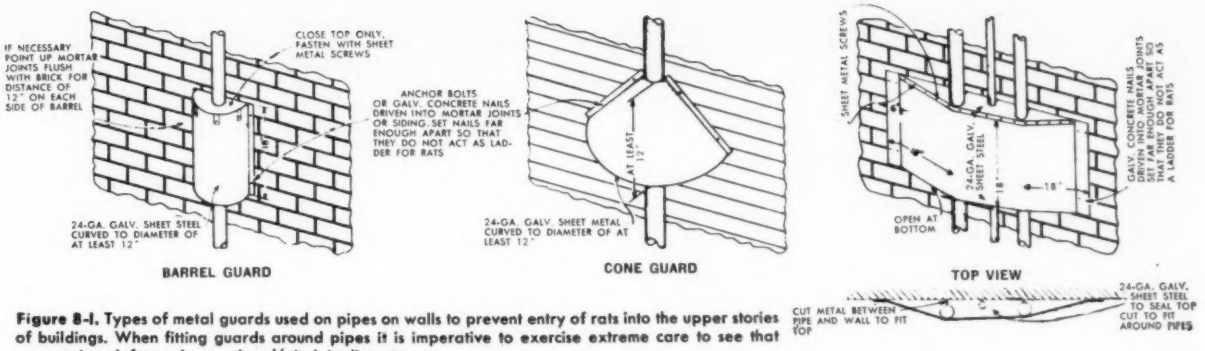

IF NECESSARY POINT UP MORTAR JOINTS FLUSH WITH BRICK FOR DISTANCE OF 12" ON EACH SIDE OF BARREL
CLOSE TOP ONLY, FASTEN WITH SHEET METAL SCREWS
ANCHOR BOLTS OR GALV. CONCRETE NAILS DRIVEN INTO MORTAR JOINTS OR SIDING. SET NAILS FAR ENOUGH APART SO THAT THEY DO NOT ACT AS LADDER FOR RATS
24-GA. GALV. SHEET STEEL CURVED TO DIAMETER OF AT LEAST 12"
BARREL GUARD
AT LEAST 12"
24-GA. GALV. SHEET METAL CURVED TO DIAMETER OF AT LEAST 12"
CONE GUARD
SHEET METAL SCREWS
24-GA. GALV. SHEET STEEL
18"
18"
OPEN AT BOTTOM
GALV. CONCRETE NAILS DRIVEN INTO MORTAR JOINTS SET FAR ENOUGH APART SO THAT THEY DO NOT ACT AS A LADDER FOR RATS
TOP VIEW
CUT METAL BETWEEN PIPE AND WALL TO FIT TOP
24-GA. GALV. SHEET STEEL TO SEAL TOP CUT TO FIT AROUND PIPES

Figure 8-I. Types of metal guards used on pipes on walls to prevent entry of rats into the upper stories of buildings. When fitting guards around pipes it is imperative to exercise extreme care to see that no openings left are longer than ½ inch in diameter.

done with poison baits or traps. Such toxicants as red squill and the anticoagulants (Warfarin, Fumarin, Pival, PMP, Diphacin) are relatively safe for use around domestic animals and can be used in homes and business establishments where the public might have access to them.

RED SQUILL is derived from the bulb of a plant which grows principally along the Mediterranean coast. It is available either as a powder or as a liquid which must be mixed with a solid bait. This is one of the safest rodenticides available, but is not the most effective. To be effective it must be used at the relatively high concentration of 10% of 500 mg./kg. material. Because of the high concentration, red squill is best mixed with baits such as hamburger or ground fish.

ANTICOAGULANT RODENTICIDES such as Warfarin, Fumarin, Pival, Diphacin and PMP are also safe to use where the public has access to them. These chemicals reduce clotting properties of blood and require repeated feedings over several days to cause death. For this reason, as well as their relatively low order of toxicity, they are quite safe to use. Concentrates are available both for mixing with water and with solid baits.

There are 5 anticoagulant rodenticides on sale in the United States:

1. *Diphacinone* (2-Diphenylacetyl-1,3-indandione). This is sold in a cereal bait at 0.005% concentration under the trade name "Diphacin."

2. *Fumarin* (3-(alpha-acetonyl-furfuryl)-4-hydroxycourmarin). The water soluble salt of Fumarin is trade named "Fumasol."

3. *Pivalyl* (2-Pivalyl-1,3-indandione). This rodenticide is sold under the trade name of Pival and others. The water soluble salt is sold under such trade names as Pivalyn.

4. *PMP* (2-isovaleryl-1,3-indandione) is sold under such trade names as PMP.

5. *Warfarin* (3-(a-Acetonylbensyl)-4-hydroxycoumarin).

MORE TOXIC BAITS in common use are sodium fluoroacetate (compound 1080), ANTU, thallium sulfate, arsenic trioxide, zinc phosphide, and phosphorus. These chemicals must be used with care because of their higher toxicity to man and domestic animals (see Table 8-1).

SODIUM FLUOROACETATE is an exceedingly hazardous chemical to use for the control of rats. The amount necessary to kill is very small. It kills very rapidly, and there is no known antidote for this poison. As technically pure chemical, it is a light, fluffy, white powder which is readily soluble in water. In commercial use, it is always colored black for identification purposes. Because the extremely low concentrations required are much more easily controlled in solution, 1080 is much safer to use as a water bait than in solid (meat, etc.) baits.

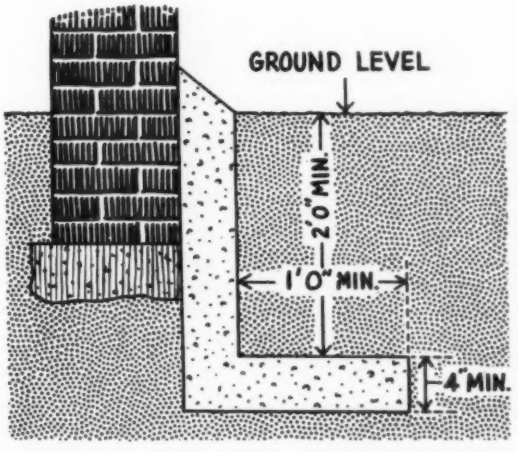


Figure 8-J. A diagrammatic cross-section of a concrete curtain wall used to keep rats from burrowing beneath buildings. Note the minimum dimensions for this type of installation.

Special precautions must be taken in the use of 1080. Where it is to be left out continuously it should be enclosed in locked bait boxes which are securely fastened to the floor. Openings into these boxes should not be larger than 2½ x 2½ inches and each box should be marked conspicuously with a danger sign bearing the skull and crossbones and the word "Poison" together with a full explanation of the hazard involved. Where baits are to be used in open containers, these should be placed about the premises only after the close of working hours. A record must be made of where each of the containers is located. They must be picked up before the beginning of work the next day. A rat or other animal poisoned with 1080 has enough poison in its body to kill a cat or a dog which may chew on the poisoned carcass. For this reason all dead rats or mice must be picked up and disposed of by burning or burial.

Complete directions and precautions for its use are available from the manufacturers of 1080. You must obtain them, study them thoroughly, and follow them explicitly if 1080 is used. The manufacturers of 1080 require purchasers to carry adequate public liability insurance at the time that 1080 is sold to them. No pest control operator should even consider using 1080 unless his insurance is in full force at the time.

Table 8-1

Comparative Toxicities of Rodenticides to Animals[1]

Animal	Approximate Doses Killing 50% (LD50) of Animals in Milligrams per Kilogram of Body Weight (Mg./kg.) except as noted:				
	1080	ANTU	Thallium Sulfate	Zinc Phosphide	Arsenic Trioxide
Norway rat	3-7 z	6.4-7.4 †	15.1-16.7	37.6-43.4	50-150
Roof rat	1-4	250 or higher	35 (LD100)	42.5 (LD100)	65 (LD100)
Albino rat	2.5-7	24-40	22.9	41-46.7	100-120
Cat	0.35-0.5	100 (LD100)			
Dog	0.07-0.2	16 (LD100)	Less than 16	40 (LD100)	
Goat	0.3-0.7				
Pig	0.3	50 (LD100)	40 (LD100)		
Horse	1				
Rhesus Monkey	5-7.5	3500-5000			
Chicken	6-30	5000 (LD100)			
Man	2*	4000*	20*	40*	1.5-15*

z Some figures are as low as 0.22 mg./kg. for wild Norway rats.
† Young rats require more — 20-50 mg./kg. (LD100).
* Estimated.
[1]By permission of U. S. Public Health Service, Communicable Disease Center.

ANTU (alphanaphthylthiourea), a specific poison for the Norway rat has an irregular effect on roof rats and house mice. It is an excellent poison where rats take a lethal dose, however they will rapidly develop an aversion and/or tolerance to doses many times normal strength. ANTU is a gray powder which is usually used at 2 to 3% by weight on solid baits.

ZINC PHOSPHIDE (Zn_3P_2) is a toxic and effective rat poison which has been used successfully for many years. It is a black powder with a distinctive odor that makes it unattractive to people and to pets. Rats are attracted to both the taste and odor of the poison. It is used at a rate of 1% by weight in solid baits. Baits must be thoroughly mixed so the zinc phosphide is evenly distributed over the surface of food particles.

THALLIUM SULFATE (Tl_2SO_4) is highly effective both when used in water solution or in solid baits. It is a heavy, white, crystalline powder usually colored blue for pest control work. In either liquid or solid baits, a concentration of 0.5 to 1.5% by weight is effective. This is a slow-acting, cumulative poison which can be readily absorbed through the unbroken skin. For this reason, every precaution must be taken to see that it does not contact your hands.

ARSENIC TRIOXIDE (As_2O_3), known also as white arsenic and arsenious oxide, is slightly soluble in water. It is commonly used as a rodenticide at 2 to 2.4% by weight in solution, or at 3% in solid baits. For either of these uses it should be in a finely ground, micronized form for best results. This poison is inexpensive, relatively slow acting, but quite effective.

STRYCHNINE SULFATE and STRYCHNINE ALKALOID are sometimes used as rodenticides particularly on poisoned seeds for mouse control. It does not normally give good results in rat control because of its extremely bitter taste and fast action.

PHOSPHORUS is used in the form of a paste. This is a hazardous chemical and must be placed only in areas where children or pets positively will not have access to it. The paste is usually spread heavily on bread as a sandwich and then cut up into approximately ½ inch cubes which are distributed where the rats can find them.

With the more toxic poisons it is sometimes advisable to add an emetic to the poison so animals other than rats will tend to vomit the bait before they receive a toxic dose. Table 8-2 indicates the correct amounts of tartar emetic to use with the various rodenticides. Make special note that *no emetic operates fast enough to reduce the poisoning effect of 1080* so that an emetic additive is ineffective with this material.

Mixing Baits

All of these poisons must either be mixed in a water solution, where this can be done, or added as solids to bait materials which are attractive to rats. Phosphorus paste has the bait material already added, so further additions are unnecessary. Anticoagulant poisons are commonly mixed with cereal baits such as corn meal, rolled oats, or cracked corn together with corn oil, peanut oil, sugar, molasses, dried cheese or similar substances which may add to its attractiveness.

The choice of food bait materials to be poisoned is very important in successful rat control. In view of the wide variety of foods eaten by rats, there is no one "best" bait to use. Meat, fish, cereals, fruits, vegetables, nuts, and many other baits are acceptable. Baits may be ground, sliced in thin slices, or cut into ½-inch cubes. In all cases the poison must be thoroughly mixed with the bait so an even distribution is obtained.

Table 8-2

Proportions of Tartar Emetic to Use with Rodenticides[1]

Rodenticide	Small Amounts			Large Amounts		
	Poison	Tartar Emetic	Bait Materials	Poison	Tartar Emetic	Bait Materials
Zinc Phosphide	20 g.	7½ g.	1972 g.	4 oz.	1½ oz.	25 lb.
Thallium Sulfate	10 g.	6 g.	1984 g.	2½ oz.	1½ oz.	30 lb.
ANTU	60 g.	60 g.	1880 g.	1 lb.	1 lb.	31 lb.
Arsenic Trioxide	60 g.	22½ g.	1917 g.	1 lb.	6 oz.	32 lb.
1080	No EMETIC is fast enough to use with 1080					

[1]By permission of U. S. Public Health Service, Communicable Disease Center.

Do not use more than the recommended amount of any poison because this will increase the danger of the bait to man and animals, and may decrease acceptability of the bait to rats.

It is frequently necessary to prebait with unpoisoned foods in order to find out what the rats in a particular situation prefer. When several different foods are exposed, rats will usually do most of their feeding on one or two of them. The preferred baits should then be poisoned to obtain control.

Baits, whether liquids or solids, should be placed in rat runways wherever possible. Solid baits should be placed in small cups or dishes so they can be easily picked up when they are no longer needed. Place all baits close to walls and near doorways wherever possible and do not put out more baits than the rats are likely to consume for this will create a hazard to pets and children.

Three Kinds Of Traps

In certain situations, particularly where there is danger of contaminating food products or of harming pets or children, it may be necessary to trap for rats. The trap most commonly employed in rat control is the wood base snap trap. This trap may be used with bait or the trigger device may be expanded and the trap used without bait. See Figure 8-K. Steel traps as are used to catch small fur-bearing animals are less

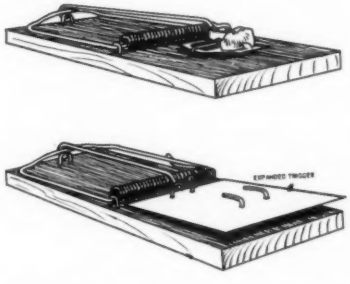


Figure 8-K
Two types of traps used in rat control. (Above) A large snap trap set for use with bait. (Below) The same trap fitted with a square of cardboard or metal as shown here can be used in rat runways without using bait.

suitable for use in trapping rats. Such traps usually catch the rat by snapping shut on one leg, and the rat will often chew the leg off and escape.

With the first, suitable food baits not larger than the end of the index finger are tied to the trigger of the trap and set in a runway.

With the second, a piece of screen wire or light cardboard is securely attached to the trigger and set in a runway so a rat crossing the trap will step on the enlarged trigger and be captured.

In all cases, the traps must be set in rat runways. Where necessary, boxes or other obstructions may be placed along a wall to create a runway so the rats will have to cross your traps. It is necessary to move traps and change baits frequently since rats easily become trap shy and will avoid traps baited with the same food or left in one location too long.

GASSING OUTDOORS

Rats in burrows outdoors can be killed by gassing. Chloropicrin and calcium cyanide are both generally used for this purpose.

CHLOROPICRIN mixed half and half with motor oil will remain in burrows for a month or more and will not only kill rats in the burrow but will repel other rats which might otherwise use the empty burrows.

CALCIUM CYANIDE is available as a dust which can easily and safely be put into burrows either with the foot pumps specifically made available for this purpose or with the small hand bulbs and dusters used to apply insecticidal dusts.

Figure 8-L. The house mouse, *Mus musculus* Linnaeus. The small size of this rodent and the characteristics of the ears and feet which are rather small and delicate in relation to the body will serve to differentiate this species from a small rat.

In every case, close the burrow openings to retain the gas within the burrow. This also aids the operator in telling whether a burrow has been reopened and rat activity still persists. You can usually close burrows by simply stomping dirt into the hole with the heel of your shoe.

MICE

THE HOUSE MOUSE, *Mus musculus musculus* Linnaeus and two subspecies, *Mus musculus domesticus* (Rutty) and *Mus musculus brevirostris* Waterhouse, are the common mice which pest control operators are called on to control. *M. m. domesticus* is more common in the northern states and *M. m. brevirostris* in the southern states, however, in a large portion of the country their ranges overlap. These mice can be easily distinguished from small rats by their small eyes and small feet (see Figure 8-A). The two subspecies are so similar that some authorities refer to them both as the same mouse under *Mus musculus*.

House mice are very similar to young black rats. The ears are large, the tail is as long as the head and body together, and the feet are short and broad. Individuals living indoors are usually dark gray on the back and light gray on the belly, while in those living outdoors the hair tips frequently become bleached so they may look sandy or brownish (see Figure 8-L). Almost any color combination is possible and albino, black and mixtures of black and white have been bred in the laboratory.

HABITS OF MICE

Mice are "gnawers" or "nibblers" by nature and thus tend to make small holes or other slight damage in many places rather than a lot of damage at one place. The mouse has keen senses of touch, smell, and hearing. It can run, climb, jump, and swim very well although it cannot climb as well as most rats.

The nest is made from almost any soft material chewed into small bits to make a soft bed. On occasion, mice have been found using a large community nest in which several females will raise their young at the same time.

There are usually 6 to 8 young in a litter. These are blind and naked and are weaned in about 3 weeks at which time they leave their mother. The mother is capable of breeding again in 3 to 6 weeks after bearing a litter and will usually average about 5 to 6 litters each year. The normal life span for a wild mouse is less than 1 year.

House mice eat about the same food as humans,

including cereals, seeds, fruits, and vegetables and are especially fond of sweet liquids. Because they nibble, they may feed as often as 15 to 20 times each day consuming only a small amount of food each time. They are apparently able to survive for periods of several months without water, particularly when the food supply contains some moisture (such as fruit). Where water is readily available they usually prefer dry foods.

Mice cause a great deal of damage to materials which they destroy and, because of their habit of nibbling, contaminate much of the material which they do not actually destroy.

Mice can transmit disease to man. Rat-bite fever and Weil's Disease can be transmitted by mice, and the droppings of mice can carry the organisms which cause food poisoning. Murine typhus can be carried by their fleas, and Rickettsialpox can be transmitted by a mite which lives on them.

MOUSE CONTROL

Mice do not usually travel very far from their nests unless a very heavy population or a lack of food or water forces them to do so. For this reason, baits should be placed not farther than 10 to 20 feet apart for good control.

SIGNS OF INFESTATION

It is important to look for signs of mouse infestation so you will know the extent of the problem before you begin control measures. Fresh droppings are a sure sign of mice. Care must be taken to distinguish droppings from those of the larger roaches which are frequently found in the same areas. Mouse droppings are smooth and have pointed ends, whereas the roach droppings have blunt ends and lengthwise grooves. Mouse nests are frequently found in and near their food supply. Holes gnawed by mice are usually small and clean cut rather than large and torn as they are when made by rats.

Good sanitation is essential for good mouse control. Since mice must have a constant food supply, no food particles must be left about on the floor, on shelves, or on table tops. All food should be kept in tightly-sealed containers. Candy and other food materials in bulk storage can be protected by being kept inside enclosures made of ¼ inch wire mesh. Buildings can be mouse-proofed by closing openings around pipes, doors, windows, holes in walls, and other places similar to those necessary for rat-proofing. Because mice can often enter any opening larger than ¼ inch, it is frequently difficult to find all openings. Most mice in houses and commercial buildings are brought in with merchandise.

Trapping is an effective method of control. You must be careful to place an ample number of traps because mice do not travel very far. A dozen or more traps in a single area is not an excessive number.

Put traps with the trigger end toward and touching a wall or other surface along which mice travel. Trapping can be done without the use of bait by fastening a piece of cardboard to the trigger to enlarge its surface and setting the trap against a wall. A mouse attempting to cross the trap will step on the enlarged trigger and set it off.

Some mouse traps are designed to be used without bait and can be used to capture several mice with one setting. The trap illustrated in Figure 8-M can be wound up and will catch as many as 18 to 20 mice without further attention. It is designed to be set end-on against a wall so that the mouse, in following the wall, will go through the opening in the trap and be knocked into one end of the box after which the trap is automatically set to go through the cycle again.

Figure 8-M
An automatic, self-setting mouse trap. This unit may catch up to 20 mice per setting and can be a valuable piece of equipment, particularly where large populations are present in a limited area.

Trapping of all kinds, and particularly with the automatic trap, is very desirable in such places as food processing plants and in walk-in refrigerators and cold storage areas where baiting with poisons is hazardous.

Another effective means of mouse control which is particularly important in situations in which toxic materials should not be used is the glue board. Rat and mouse glues are very sticky materials available commercially from a number of sources. These adhesive materials are spread over cardboard or wooden squares which are then tacked down to floors across rodent runways. As the animals attempt to cross the boards their feet become entangled and they are unable to free themselves. This technique is also effective against rats but, being larger and more powerful animals, they are more likely to pull themselves free from the glue than are mice. If a rat gets more than two of its feet entangled, it is rather unlikely to escape. Glue boards should be at least 12 inches by 12 inches, although smaller boards can be used for mice.

Bait for mouse traps must be carefully selected. Cheese, although frequently the choice of the housewife, has no place in commercial mouse control. Bacon, nuts, hard sugar candy, gum drops, peanut butter, and small sardines are usually the best baits. Solid baits should be tied firmly on the trigger. When mice are removed from traps as they are caught, it is quite possible to catch a dozen or more with the same trap without changing the bait.

The same poisons used for rat control (with the exception of red squill and phosphorus paste) will give effective control.

To bait for mice, place large numbers of smaller baits, rather than smaller numbers of large baits since mice do not usually travel very far in search of food. Make it easy for a mouse to find your bait. Place cups of bait along walls and other runways actually touching the walls. A bait placed several inches from a wall may be bypassed consistently. Be very careful to bait near all openings to the outside of the building where mice may enter, and also bait next to all doorways within the building which remain open. Be very careful to replace baits frequently because mice are not attracted to old, dirty baits.

DDT, which is ineffective as a tracking powder for rats, gives excellent results against mice. Use care with DDT in areas where food is stored.

Selected References

"Rat-borne Diseases, Prevention and Control," Federal Security Agency, Public Health Service, Communicable Disease Center, Atlanta, Georgia, 1949, 292 pp., illus.

Mallis, A. 1960. Handbook of Pest Control, 3rd ed., MacNair-Dorland Co., New York, 1132 pp., illus.

"Insect and Rodent Control," 1956, U.S. Dept. of Commerce, Office of Technical Services, No. PB161357, 172 pp., illus.

The following leaflets are available without cost from the U. S. Fish and Wildlife Service, Agricultural Experiment Station, Lafayette, Indiana. Others will be available when published:

No. 318 — Poisoning Rats & Mice: Anticoagulants
No. 319 — Poisoning Rats & Mice: Bait Stations
No. 320 — Trapping Rats & Mice
No. 321 — Controlling Rats & Mice: Tips for Homemakers

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NEWS OF THE 1961 ANNUAL NPCA CONVENTION

OCTOBER 15-19

For land-locked NPCAers, the soft surf-salted sand beaches of the Atlantic shores at Miami Beach offer a stimulating opportunity to be rejuvinated by the sun and sea breezes before starting back to work!

To Emphasize Management, Control "How-To"

"How to do it" is to be the theme for this year's National Pest Control Association annual convention and trade show to be housed in Miami Beach's Hotel Deauville, Oct. 15-19, according to word from executive secretary, Dr. Ralph E. Heal.

Monday's formal program is to feature ideas on how to sharpen up the business management of a PCO operation. Tuesday, delegates will be shown how to run a training session to instill the proper know-how in servicemen. On Thursday, experts will demonstrate how to promote a firm's public relations in its own community.

On the technical side, how-to ideas will come Tuesday afternoon, all day Wednesday, and Thursday morning.

Pocket-pinching expenses brought on by ignoring safe practices are to be laid open on Thursday afternoon when practical suggestions on how to eliminate soft-spots in the industry's safety observance will be offered.

Members will also learn how to use NPCA offerings and how to sell association membership to other PCOs in order to strengthen their own program and to provide greater service to more industry members. James M. Sims, Cardinal Pest Control Co., Montgomery, Ala. is '61 membership chairman who's to head-up these promotional endeavors.

Make Hotel Reservations Early

Indications are this year's NPCA show will have the largest attendance in its 29 years, so PCOs are urged to write the Hotel Deauville in Miami Beach, Fla., for reservations as soon as possible. Special low rates prevail.

Poolside Entertainment, Tour

Interspersed among business and technical sessions will be a poolside mixer with dancing and refreshments Monday evening, a tour of Miami Beach and Miami with a visit to the Seaquarium on Tuesday, special surprise entertainment Wednesday night, and the big banquet and dance Thursday evening. In addition, ladies will visit the gorgeous Vizcaya mansion, and have an excursion to the Lincoln Plaza shopping center. On the opening Sunday there'll be the reception and tea. There's also a three-day excursion to Nassau beginning Friday morning, Oct. 20. A technical meeting is planned for delegates at the British Colonial Hotel in Nassau on Saturday morning, but the rest of the time will be free for sightseeing.

Pesticides, Roaches, Termites

Association committees meet all day Wednesday, Oct. 18 to allow delegates to air problems and obtain solutions on wood destroying organisms, insecticides, bird management, rodent control, fumigation, insurance, advertising, public relations, equipment, and statistics.

Results of NPCA sponsored university research on roach and termite control, at Virginia, Georgia, and Oklahoma, are to be given Tuesday morning.

NPCA staffers who work with members on technical committees, Technical Director Dr. Philip J. Spear (left) and Technical Assistant, Richard T. Moore, will take part in the Wednesday technical program.

Kills roaches, fleas, flies, brown dog ticks, silverfish, gnats. Registered for P.C.O. use

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Sometimes the product and not the price counts most, but it is always good business to compare costs. Remember percentage and poundage of DDVP are not the same thing between products. Percent of DDVP times net weight gives the pounds of DDVP/gal. But more important, it is the lb. of DDVP/gal. divided into the price/gal. that compares the cost per lb.

Herkol 50 WE is 50% DDVP with the net weight 11 lb. per gal., so .50 x 11 = 5.5 lb. DDVP/gal.It lists per gallon bottle at $37.95, therefore 37.95 divided by 5.5 equals $6.90 per lb. of DDVP.

Try a few of these calculations if you haven't already.

HERKOL 50 WE INSECTICIDE

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*by weight

Krupnick Uses Portable Plumber's Heater When Drilling Asphalt Tile Holes

After trying a number of different techniques suggested by others, for drilling through asphalt tile over concrete with a minimum of damage to the floor, Edward Krupnick devised a method of his own that he thinks is just about right.

Ed, who runs Termite Proofing Service, Inc., in Lakewood, New Jersey, decided against using torches because of the danger involved and also because they tend to blister the tile and remove wax from a large area. He tried brooder lamps to soften the tile, but the bulbs crack too easily.

The object is to heat the tile sufficiently so a circular piece of it can be cut and removed to permit drilling through the concrete beneath for injecting termite chemicals into the area under the slab floor.

Ed Krupnick uses a portable electric heater, that looks like a woman's hair drier but is far from being one. Actually it's the type plumbers use to thaw pipes when flames or torches cannot be used. It develops 500° at the nozzle.

After marking an X on the floor with chalk where the hole is to be drilled, the area is heated for about 10 seconds, holding the heater over the chalk mark.

Next, a ¾" leather punch is used to remove a perfectly round piece of tile. The removed core is kept at the spot so this identical piece

Here's how Ed Krupnick readies asphalt tile for drilling. In top picture (1) serviceman uses plumber's electric heater to soften tile so a circular disc can be cut with a ¾" leather punch as shown in middle photo (2). Picture (3) at the bottom reveals concrete slab through the neat hole that has been punched out. Note cut-out piece of tile is placed nearby so it can be replaced after treatment is completed.

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REELS BY HANNAY®

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Drilling through slab does not mar asphalt floor covering when circular cap has been removed. After slab injector is used to pump chemical through drilled hole into area beneath, hole is sealed with quick-setting cement, the cap glued back into place, and only a very close inspection would reveal any work had been done there at all.

can be replaced to match the rest of the tile perfectly.

Then, using a $\frac{5}{8}$" bit, a hole is drilled through the slab and a slab injector inserted into it. Krupnick has outfitted the injector with a machined-tip over the bottom and had 4 holes drilled into the sides so his chemical shoots out at right angles, rather than straight down. He feels this gives better coverage.

After the hole is treated, it is plugged with quick-setting hydraulic cement. Lastly, an adhesive is placed on the bottom of the cap or circular piece of tile and it is carefully replaced so the design matches again with the rest of the block. Only visible evidence that a hole has been drilled is a minute round line around the cap.

BRAB Reports for TOs

Several publications of the Building Research Advisory Board are of interest to termite control operators. Working as an arm of the National Academy of Sciences, National Research Council, BRAB is a non-profit corporation that studies and advises on subjects of building science or technology. Its publications are available from the Printing & Publishing Office, National Academy of Sciences, Washington 25, D. C., for the prices given after each title listed below. TOs wanting to know more about the structures they are called upon to keep termites out of, may want one or more of the following BRAB reports:

"Housing and Building in Hot-Humid and Hot-Dry Climates." '52, 177 pgs., $4.50. Living and building in hot climates, including architectural design, structures and materials, and mechanical problems.

"Protection Against Decay and Termites in Residential Construction, and Addendum," No. 448-A. '56, '58, 103 pgs., $2.00. Construction methods to prevent termite ingress and decay; effectiveness of wood preservatives and soil poisons; natural resistance of woods.

"The Use of Grade Boards in Individual Household Absorption Field Trenches," No. 506. '57, 24 pgs., $1.50. Acceptable methods of establishing grade for different types of distribution lines.

"Protection from Moisture for Slab-on-Ground Construction and Habitable Spaces Below Grade," No. 707. '59, 74 pgs., $1.50. When moisture barrier is needed; when barrier may be located at top of slab; moisture protection for slabs and walls of habitable spaces below grade; vapor barrier service life.

The following studies are now in progress for the Federal Housing Administration and are to be completed in 1961. "Criteria for Ducts Encased In and Under Concrete Slabs," "Use of Ground Cover in Crawl Spaces," and "Maximum Continuous Temperature for Vapor Barrier Materials."

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7/32 - 4	1.33	2.66	3.33
7/32 - 6	1.33	2.66	3.33
5/16 - 4	1.40	3.33	4.00
5/16 - 6	1.40	3.33	4.00
3/8 - 4	1.53	3.73	4.40
3/8 - 6	1.53	3.73	4.40
7/16 - 4	1.73	3.86	4.54
1/2 - 1/4 sk	2.00	4.00	4.67
1/2 - 3/8 sk	2.00	4.00	4.67
7/16 - 6	2.26	4.40	5.06
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Dr. Gaines Tells Texans of Residual Toxicities

At this year's PCO Short Course, put on by Texas A&M College in College Station, entomology chief Dr. J. C. Gaines told about his research into the residual toxicities of insecticides.

Although the purpose of his investigations was to discover the effect of climatic conditions on insecticides used to control cotton pests, his findings are indicative of what a termite operator might experience in his treatments. All experiments were conducted in the laboratory so individual climatic factors could be controlled.

Within the effective limits, the ranges of temperature and humidity were not important in determining the period of residual toxicity of chlorinated hydrocarbons, Dr. Gaines found.

In general simulated rain appreciably reduced the residual toxicities of chlorinated hydrocarbon insecticides to all test insects.

Among the chlorinated hydrocarbons, Dr. Gaines also reported that there was little difference between the effects of simulated wind and rain on residual toxicities. However, it is likely that under field conditions the effects of rain would be more noticeable.

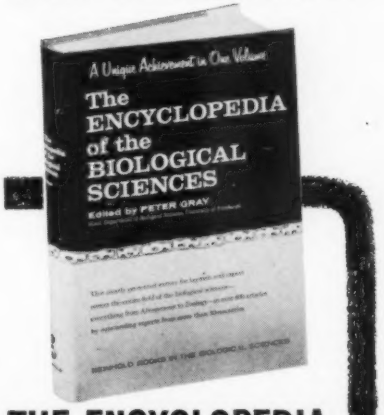
Much of Dr. Gaines' work was directed toward discovering what happened to pesticide residues on cotton plants and his conclusions are based upon that interest. His research, however indicates the importance of taking weather into consideration when testing pesticide longevity and suggests more investigations need to concentrate on what happens to termiticides used as soil poisons.

Bulletin 951, "Residual Toxicities of Insecticides to Cotton Insects" by Hightower & Gaines, carries details of their experiments and is available from Texas A&M.

Keep Chemicals Agitated

To assure uniformity of chemical distribution in formulations used to treat soil for termites, the pesticide must be continuously agitated in the tank from which it is being pumped. This is especially important with cold water solutions in which toxic ingredients are more likely to settle out.

Over 800 articles by leading scholars from 33 countries!



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edited by PETER GRAY

Head, Department of Biological Sciences, University of Pittsburgh

IF IT FALLS between *Abiogenesis* and *Zoogeography*, you'll find it in this remarkable survey of the entire field of the biological sciences. Experts from the world over—selected for their international reputations—present the developmental, ecological, functional, genetic, structural and taxonomic aspects, in addition to covering numerous topics in biochemistry and biophysics. No other single work on the subject even approaches its completeness of coverage.

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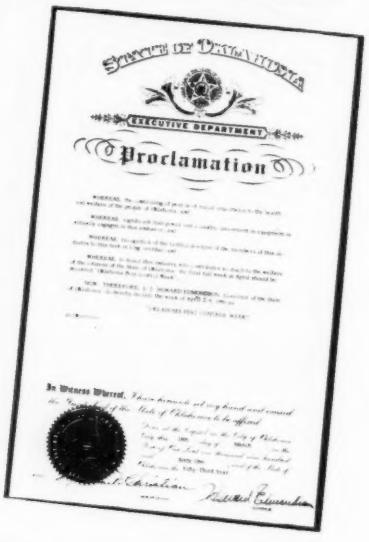
Governor Howard Edmundson (right) invited Okla. PCA president Herman Kopp (left) to witness signing of official proclamation for public recognition of pest control industry from April 3 through the 9.

Copies of Proclamation were sent to all state newspapers.



Parade, Proclamations, TV, Radio, Newspapers Herald Statewide Oklahoma Pest Control Week

Assn. Plans It Again for '62

A 100-piece parade, proclamations by Oklahoma's Governor J. Howard Edmundson and several local mayors, plus on-the-spot coverage by TV, radio, and newspapers, focused public attention on the pest control industry throughout Oklahoma during the first week of April this year. This is said to have been the first statewide "Pest Control Week" ever to be held (PC, Apr. '61, pg. 64). Because the venture was so successful, members of the sponsoring Oklahoma Pest Control Association want to make it an annual affair.

Idea for the opportunity to promote pest control companies in this way was first presented by Velsicol Chemical Corp. to the association at its annual meeting during the Oklahoma State University PCO Conference in February. Velsicol said it would supply the sales promotion and publicity materials, along with sample releases, window streamers, banners, and suggestions on how to stage the campaign. Its salesmen would work with association officials to help them make the most of this chance to build the prestige of PCOs throughout the state.

Even though there were less than

Oklahoma City Mayor Jim Norick (left) signs document to open PC week as association secretary Tom Graham tells him how PCO industry protects public's health and welfare.

Association president Herman Kopp (left), and v-p John O'Connor explain details of week-long observance throughout entire state to Senator Paul Skaggs (right).

Leading the Pest Control Week Parade in Oklahoma City were these spirited high school bands.

P.C.O.s make more profits with WARFARIN

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Better results means fewer callbacks.

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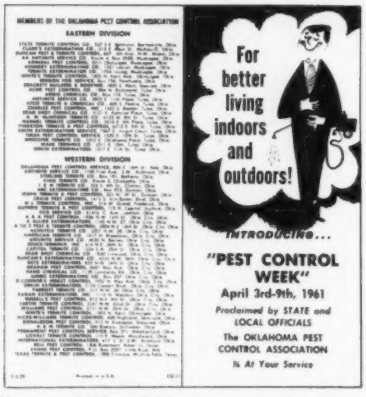

Names of Okla. PCOs were printed on back (left) of this 4 pg. folder furnished by Velsicol.

three months to get ready for the project, the membership felt here was too good an opportunity to let slip by for another year. They voted to put it on during the first week in April, from the 3rd through the 9th.

Association officers, president Herman Kopp, of Tulsa; vice-president John O'Connor, and secretary-treasurer, Tom Graham, both from Oklahoma City, formed the nucleus of the driving force behind this unique promotion stunt. They had cooperation from their board members and PCOs throughout the state.

First objective was to get recognition from officials in the state capital. A proclamation was drawn up and presented as a *resolution* to the Oklahoma Legislature. It was easier to get a resolution approved since all that's required is a reading before the Legislature and adoption by voice vote. Then it's entered into the permanent records; a much simpler procedure than attempting to get a House or Senate Bill passed. Obtaining this official recognition came with less effort than Okla. PCAers anticipated. Publicity-minded associationmen saw to it there were plenty of pictures taken of the governor signing the proclamation, as well as of their members and legislators who took part in getting the official announcement.

But let Tom Graham tell it in his own words:

"After the governor's resolution was obtained, a barrage of printed materials supplied by Velsicol was circulated about the state. Window streamers seemed to be most popular. Next came the 4-page, two-color envelope stuffer folder which lists our 76 members in both the Eastern and Western Divisions of the Oklahoma association." In fact, over 1,100 streamers and 35,000 folders were used.

"Ad mats furnished by Velsicol, that were flexible enough to include the names of local PCO firms, were used in 25 newspapers. A public relations man was hired by the association and given the authority to place ads and other technical aids in the papers. Some 11 releases were sent to 267 Oklahoma newspapers."

Letters were sent to the mayors of larger cities, along with suggested wording for a suitable proclamation they might make.

Proclaimed by State and Local Officials
Bugs away ...join today!
OKLAHOMA PEST CONTROL WEEK
APRIL 3-9, 1961
Your statewide campaign for healthier living!
JOIN IN OUR CAMPAIGN FOR HEALTHIER LIVING . . .
CALL A MEMBER OF THE OKLAHOMA PEST CONTROL ASSOCIATION FOR A PROFESSIONAL INSPECTION TODAY!
(NO OBLIGATION, OF COURSE)

Samples of newspaper ads run by PCOs during Okla. Pest Control Week.

WE ARE PROUD TO BE A PART OF
OKLAHOMA PEST CONTROL WEEK
APRIL 3-9
★ ★ ★ ★
Controlling harmful insects requires a knowledge of their habits and information of the proper procedure for dealing with them.
During "PEST CONTROL WEEK," we hope to inform the public on both of these points. As in many other issues affecting public health and safety, without the all-important basic facts, any efforts to control pests, however well-intentioned these efforts may be, would not achieve the desired goal, which is a healthful and comfortable community.
There are several areas in the home over which constant control should be maintained—first and foremost, the kitchen and bathroom. Cracks and crevices providing likely insect nesting places should be sprayed regularly.
WE INVITE YOU TO CALL ON US TO INSPECT YOUR HOME FREE AS A PUBLIC SERVICE DURING 'PEST CONTROL WEEK'
MIRACLE LABORATORIES
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FREDERICK, OKLAHOMA
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The Big Parade

Velsicol supplied every member of the association with a sales promotion and publicity kit that included typical letters that could be sent to mayors, presidents of community and civic organizations, news releases, as well as suggestions for putting to good use the ad mats, folders, and banners provided by the company, all of which tied into "Pest Control Week."

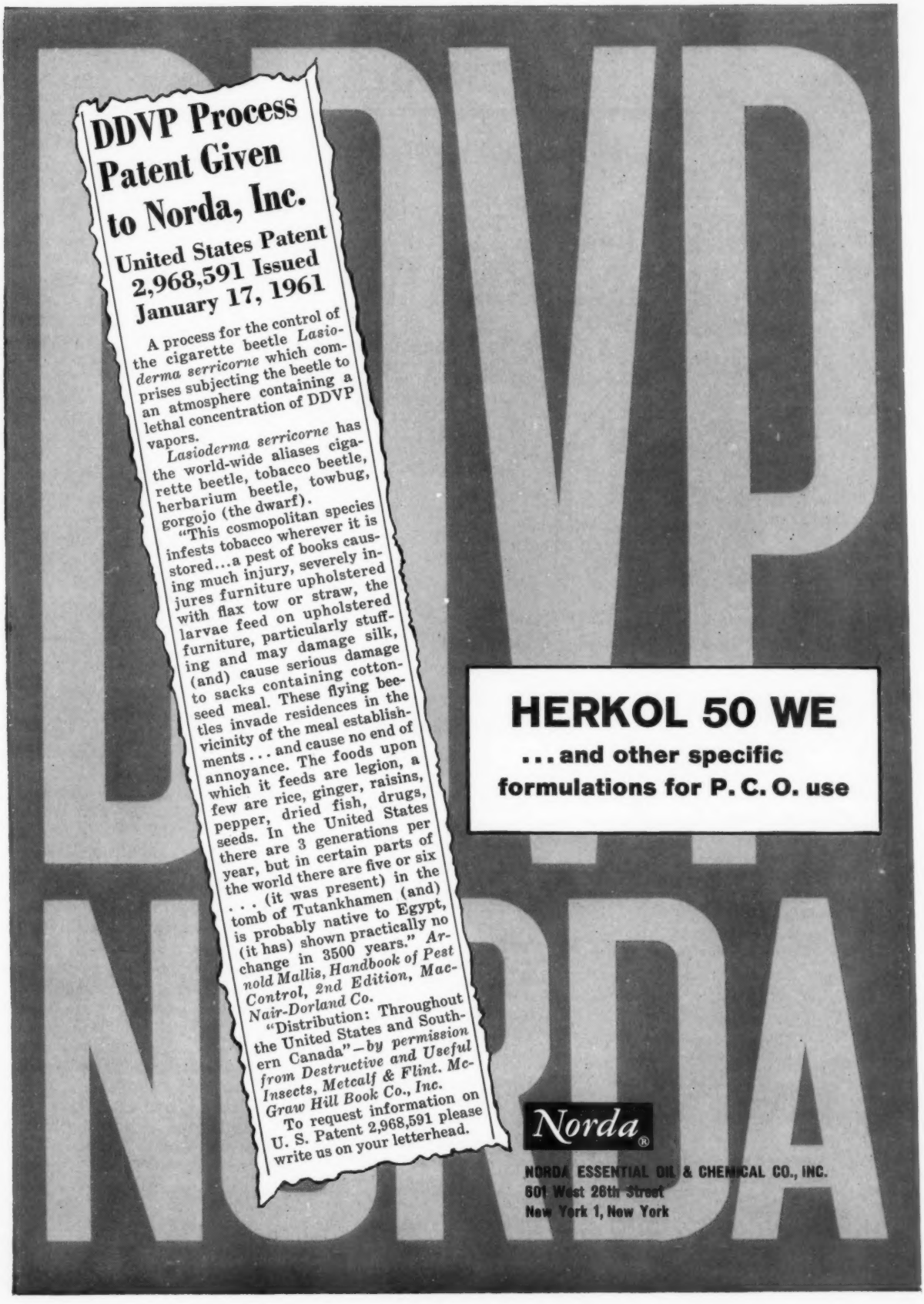
In Oklahoma City, the week was opened with a proclamation from Mayor Norick and a downtown parade led by high school bands followed by "Miss Queen Bee" and her two "Honeys." Some 30 companies took part in the procession, displaying 100 pieces of equipment, including freshly polished pretreating tank trucks, fogging machines,

Window banners were provided PCO cars.

Queen and Honey Bees in parade were (left to right) Princess Vicki Graham (daughter of Tom Graham), Queen Thyllis Bower (daughter of state entomologist Clyde Bower), and Carolyn Cole (daughter of PCO James Cole). Driver is PCO Bob Schnorrenberg.

Craig Pest Control paraded its termite model.

Hundred pieces of equipment were displayed.


DDVP Process Patent Given to Norda, Inc.
United States Patent 2,968,591 Issued January 17, 1961
A process for the control of the cigarette beetle *Lasioderma serricorne* which comprises subjecting the beetle to an atmosphere containing a lethal concentration of DDVP vapors.
Lasioderma serricorne has the world-wide aliases cigarette beetle, tobacco beetle, herbarium beetle, towbug, gorgojo (the dwarf).
"This cosmopolitan species infests tobacco wherever it is stored...a pest of books causing much injury, severely injures furniture upholstered with flax tow or straw, the larvae feed on upholstered furniture, particularly stuffing and may damage silk, (and) cause serious damage to sacks containing cottonseed meal. These flying beetles invade residences in the vicinity of the meal establishments... and cause no end of annoyance. The foods upon which it feeds are legion, a few are rice, ginger, raisins, pepper, dried fish, drugs, seeds. In the United States there are 3 generations per year, but in certain parts of the world there are five or six ... (it was present) in the tomb of Tutankhamen (and) is probably native to Egypt, (it has) shown practically no change in 3500 years." *Arnold Mallis, Handbook of Pest Control, 2nd Edition, MacNair-Dorland Co.*
"Distribution: Throughout the United States and Southern Canada"—*by permission from Destructive and Useful Insects, Metcalf & Flint. McGraw Hill Book Co., Inc.*
To request information on U. S. Patent 2,968,591 please write us on your letterhead.
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MEMBER
NATIONAL PEST CONTROL ASSOCIATION

This Month's Money Maker

PCOs Find Rat-Trol® Safe, Efficient, Profitable

by

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Sales Manager
Agricultural Chemical Division

Introduce yourselves to one of the most successful rodent control formulas ever developed: T-H Rat-Trol. It is a safe, efficient means of controlling rats and mice. Rat-Trol is easy to use and has been used successfully in both residential and commercial establishments.

Check these important points against other pesticides:

- **T-H RAT-TROL CONTAINS WARFARIN** (Warfarin is an anticoagulant of the Dicumarol® type.)
- **T-H RAT-TROL IS SAFE** Rat-Trol does not contain strychnine or arsenic; has low single dose toxicity.
- **T-H RAT-TROL IS SURE-KILL**
- **T-H RAT-TROL IS AVAILABLE IN TWO FORMULATIONS**
  Rat-Trol bait (ready to use)
  5 lb. cans (4 per case)
  1 lb. cans (12 per case)

  Rat-Trol concentrate (for mixing)
  100 lb. containers
  50 lb. containers
  25 lb. containers
  5 lb. containers

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THOMPSON-HAYWARD CHEMICAL COMPANY
P. O. Box 768 Kansas City 41, Missouri
Quality chemicals for your professional pest control operation

compressors, service trucks, and other mobile applicators.

Good coverage of the Oklahoma City spectacle was given by local newspapers, radio, and TV. Movies were made by a TV cameraman. "It was a gala affair that drew lots of public attention," Tom Graham reports.

"The excellent condition and appearance of our equipment was a revelation to everyone and we received much favorable comment on this," Graham added. "Radio and TV announcements were given as news items, and tie-in plugs were made for the Week by operators who regularly use these media to advertise their services."

In Tulsa, a reporter from the *Tulsa Tribune* put on a pair of coveralls and accompanied Association president Herman Kopp to go through the mechanics of doing a termite job. The reporter was so impressed with the amount of work that has to be done in this kind of job that he did an extensive article for his paper, complete with pictures.

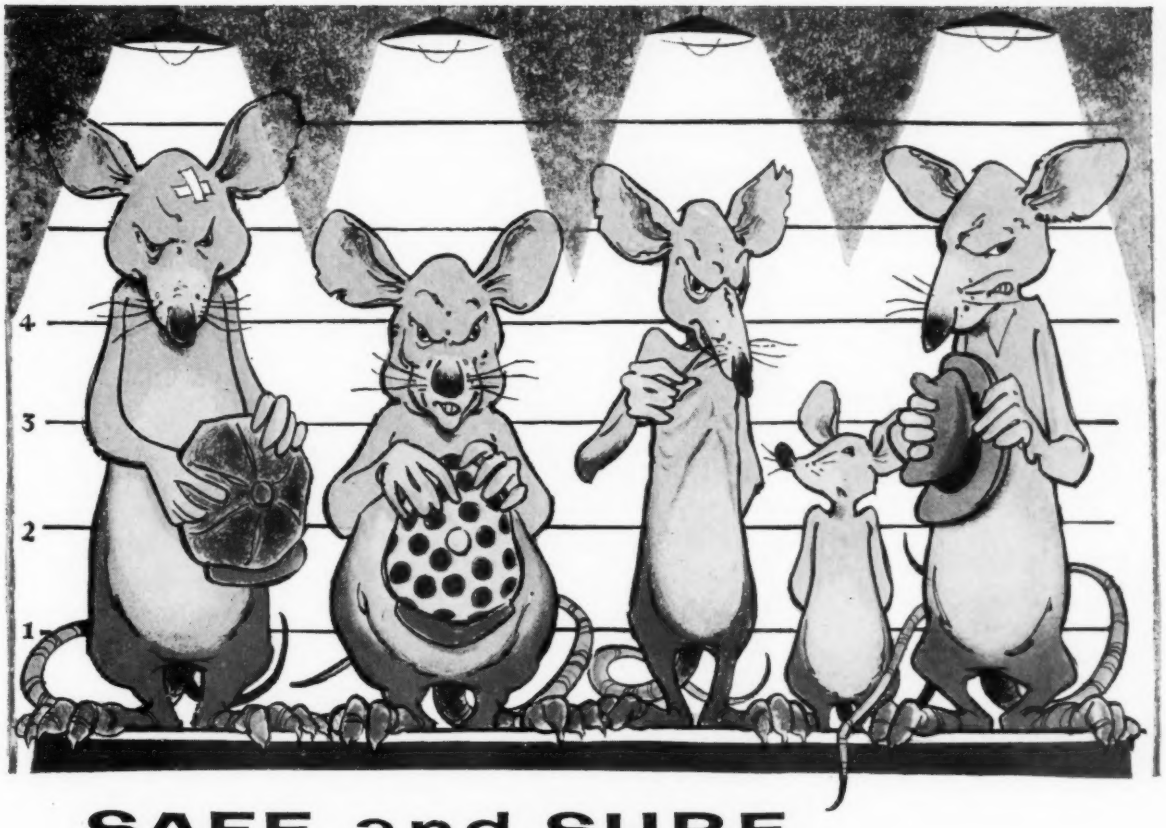
Cost: $20 per Member

Total cost to the association for the week-long program was less than $20.00 per member firm, about $1,200.00. "It was money well spent," officers report.

"Success of the program depends upon each individual operator within the state," Graham says. "How much he gets out of it depends upon how much he puts into it. You've got to contact local officials to keep them informed and to get their support, as well as go directly to the newspapers to see that they're using the releases being sent to them.

"We made a few mistakes because we didn't have much time for planning, but every member is in accord that this should be an annual thing, and we are already starting to make preliminary plans for next year. We're proud to have been the first association to have a Statewide Pest Control Week," secretary Graham boasts.

Word from Velsicol is that the campaign worked out in cooperation with the Oklahoma group is available to any state PCO association willing to actively boost the pest control industry. Several are already said to be making arrangements to put on a similar promotion in '62.



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Fat rats, hungry rats, strong rats or small rats . . . WARFARIN kills 'em all. Kills mice, too!

World's most famous and most potent rodenticide, WARFARIN is tasteless, odorless, painless. Rats and mice never become bait shy, never build tolerance.

And because WARFARIN is an anti-coagulant, harmless to humans when used as directed, it is approved for use in food establishments and is ideal for permanent bait stations. It's economical as well, since low concentrations give fast, positive results.

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What's NEWS In The Industry

Dates for Tenn. Convention Changed to Sept. 21-23

The '61 annual convention of the Tennessee Pest Control Association will be held one week later than previously announced. New dates are September 21-23, with registration beginning at 6 p.m., Thursday, Sept. 21. Headquarters is to be the Riverside Hotel in Gatlinburg.

For program details, write Dan W. Cauble, Jr., Biltmore Exterminating Co., 2831 Broadway, N.E., Knoxville.

Mo. U. PCO Short Course Announced for Nov. 5-7

This year's PCO Short Course put on by the University of Missouri Department of Entomology in the Student Union Building in Columbia, is to run from Nov. 5 to 7 according to Dr. Philip C. Stone, MU entomology chief.

On Sunday evening, Nov. 5, there will be a get-together buffet dinner sponsored by the Mo. Pest Control Operators' Assn. The conference itself will feature 15-minute talks on pertinent, timely subjects of interest to PCOs. A banquet, followed by a formal program, is scheduled for Monday evening. The meeting will end Tuesday at noon.

In charge of arrangements are John J. Veatch, Wood Treating Chemicals Co.; John C. Toensing, Rose Exterminator Co.; and Larry D. Landry, W. B. McCloud & Co., all of St. Louis, and the staff of the university's entomology department.

Ill. Workshop Set for Dec.

Sponsored by the Illinois Pest Control Association since 1950, the 1961 Management Workshop will be co-sponsored by the National Pest Control Association. It is tentatively scheduled for Dec. 5 through 8.

This workshop is presented by the Bureau of Business Management of the University of Illinois in Urbana, one of the outstanding business training institutions in this country.

Florida PCA officials for the next 12 months (top photo), elected during West Palm Beach convention are (left to right) Leon Payne, immediate past president; W. B. Clements, secretary-treasurer; W. J. Horton, director; Ed Doty, director; Ken Nolen, president-elect; Roy McArthur, director; Cliff Harding, director; Larry Davis, vice-president; R. J. Gordon, director; and Henry C. Petri, new 1961-62 president. Director Norman Armour was not present. Examining the "super race of insects" in the photo immediately above are program participants (from the left) LeRoy Weisburger, F. R. DuChanois, Herman Fellton, and Dr. Ralph E. Heal.

No Paid Secretary For Now, Fla.

PCA Palm Beach Meet Decides

Officers of the Florida Pest Control Association will continue on a volunteer basis for at least another year. This was the decision of members at the association's 15th annual convention in Palm Beach, June 22-24.

It had been proposed that the Fla. PCA should hire a paid secretary because work of the organization has grown and there is much more that can be done to promote the industry. For awhile the idea was considered seriously, but final outcome of discussions resulted in a realization that there is not enough money under the present dues schedule to finance both employment of a man and an expanded program.

The suggestion for a paid staffer undoubtedly came after the extra load required this year of officers in quelling legislation unwanted by PCOs in the state. One official said, "The volunteer effort of the Florida association indicates what the impact can be upon a legislature when members cooperate by letting their state representatives know how they feel. It is only through this joint effort that we were successful in defeating legislation that would have been detrimental to the industry."

Attendance at the Palm Beach convention attained an all-time high of over 200, nearly half of which were wives and children. It was a combination business and family holiday.

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- All new "Venturi" nozzle impels fog farther
- Dispenses up to 5 gal. per hour
- Heavy gauge, one gallon, aluminum beaded tank
- ⅛" feed line; does not clog
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Chlordane	Malathion	Dieldrin	Pyrethrins	P. M. P.
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exterminators have left Florida to set up shop in other states," R. Earl Dixon, of Peninsular Pest Control, in Jacksonville, told the group during his talk on how structural pest control laws work in other states. He said the 1947 legislation which put PCOs under the Florida Structural Pest Control Commission (Dixon is chairman this year), is responsible for policing the industry in Florida which had only 83 bonafide cases in '60 compared with 2,900 in another PCO regulated state.

F. Robert duChanois, from the Florida Board of Health, described places where improvement could be made in current control work through his talk on shortcomings in subterranean termite work.

"Take a lesson from the termite," adman Abe Weinstein urged delegates. The president of Harris & Weinstein Associates, Atlanta, Ga. advertising agency drew a parallel between the termite's timing, continuity, saturation, selectivity, appearance, wise appropriation, and ethics, and the principles of good advertising to illustrate how PCOs can get the most for dollars spent to promote their business.

Industry members must pay closer attention to safe practices, NPCA executive secretary, Dr. Ralph E. Heal, emphasized. He said today's high insurance premiums are the result of careless practices in the past that did not take into consideration changing application practices brought on by resistance problems. New York insurance expert, LeRoy Weisburger, of B. & D. A. Weisburger, underlined Dr. Heal's warnings and urged PCOs to make a more thorough analysis of their coverage to be sure they are protected against all eventualities.

University of Fla. entomologist, Dr. Stratton H. Kerr, reviewed progress made with various chinch bug control chemicals, as detailed in his article on page 9 that appeares in PC's May issue. Herman Fellton, president of Getz Exterminators, Atlanta, Ga., spoke on two occasions during the three-day convention, once on what lies ahead for the industry, and again on termite control. Dow Chemical representative, Barrett Collier, explained how his company's new fumigant, Vikane, fits into drywood termite work.

Rudolph P. Tomasello was chairman of the convention committee, and retiring president Leon W. Payne, of Gulfstream Exterminating Service in West Palm Beach, was ex-officio host.

New officers elected for 1961-62 are: president — Henry G. Petri, Petri's Positive Pest Control, Miami; president-elect — Ken Nolen, Nolen Exterminators, West Palm Beach; vice-president — Lawrence E. Davis, Termitrol Engineers, Clearwater; and re-elected secretary-treasurer is William B. Clements, Clements Pest Control & Garden Supply, Leesburg.

Board members for the coming year are: Clifford Harding, Hollywood; Norman Armour, W. Palm Beach; Roy McArthur, Lakeland; Ed Doty, Daytona Beach; W. J. Horton, Jacksonville; and R. J. Gordon, Pensacola.

Next year's convention will be held in Tampa during June. Exact dates are to be announced later.

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METHYL BROMIDE
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WITH OR WITHOUT CHLOROPICRIN

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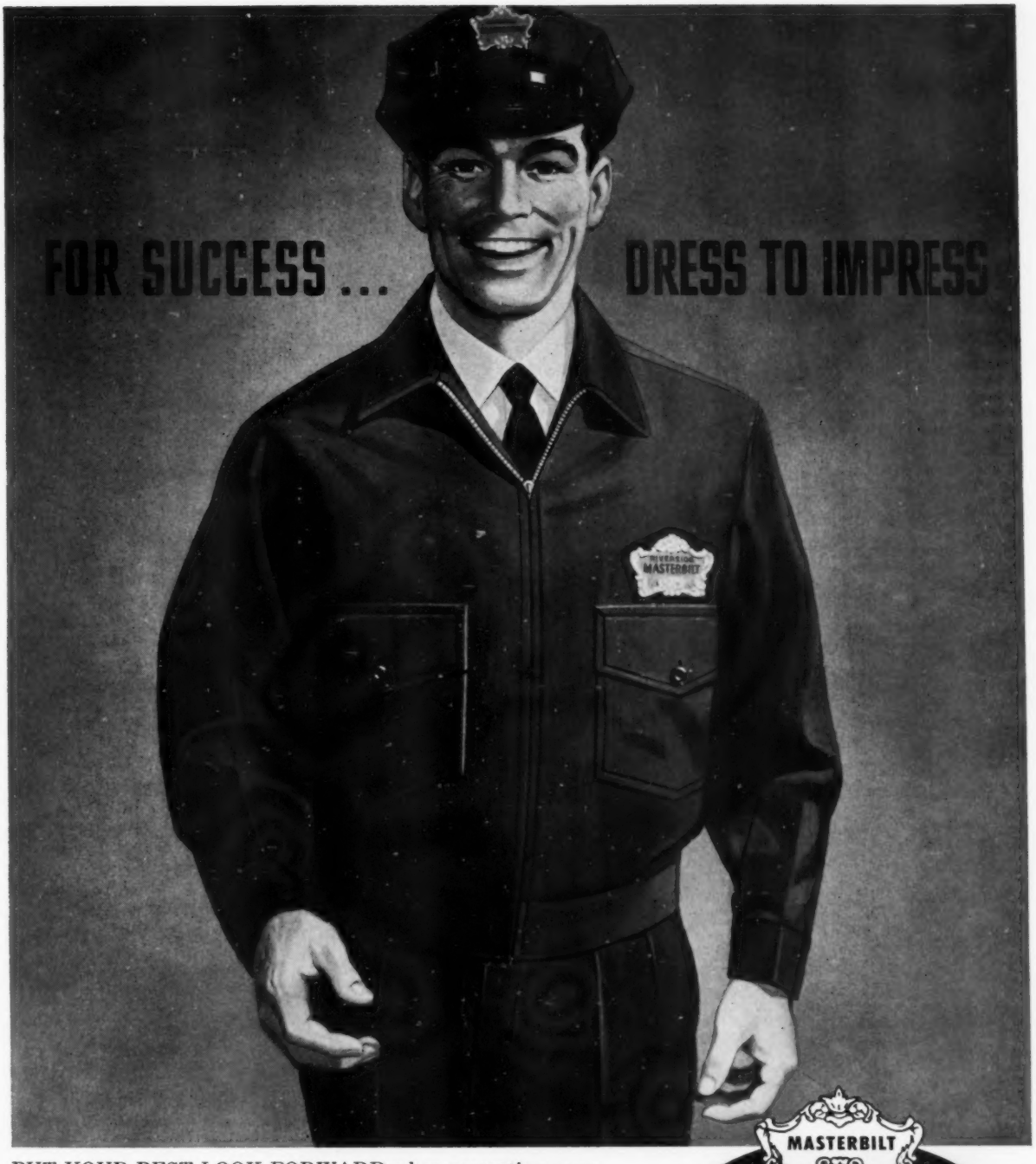

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MOULTRIE, GEORGIA

Scholarships given by North Carolina Pest Control Assn. for 1961 are presented by Dr. Clyde F. Smith (left), Entomology Dept. Head at North Carolina State College, to James P. Brock and Robert E. Brock, as Dr. Homer Folks (extreme right), Director of the NC Agricultural Institute, looks on. The scholarship award was established by the NCPCA for worthy students in the pest control curriculum of the college's Agricultural Institute.

$200,000 Insecticide Study

A $200,000 grant has been made by the U.S. Dept. of Health, Education, and Welfare over a 5-year period to scientists at Cornell University to help build more effective qualities into new insecticides.

Key researchers in the project are Prof. Richard D. O'Brien and Walter C. Dauterman. They hope to find out why some insecticides are poisonous to certain insects, but not to others. This would help to develop new insecticides that aren't poisonous to mammals, and might also assist in formulating new rat poisons that wouldn't harm dogs or cats.

Malathion for Stored Peanuts

Malathion spray is effective, safe, and economical as treatment for preventing insect infestations and damage in stored peanuts, according to research by the U. S. Department of Agriculture. A tolerance of 8 parts per million of malathion in peanuts is established under the Food, Drug, and Cosmetic Act. Recommendations are based upon results of a 5-year study by the USDA.

For bulk treatment, use an emulsifiable concentrate of 57% premium-grade malathion at the rate of 2½ pints in 5 gals. of water for each 15 tons of farmers stock peanuts. Use good spray equipment and apply coarse spray uniformly. The USDA says preferably use a suitable mechanical spray applicator that regulates the rate of application to the flow of peanuts.

For surface treatments, use 1¾ lbs. of 25% premium-grade malathion wettable powder formulation in 2 gals. of water for each 1,000 square feet. Apply the first surface treatment as soon as the bin is

Instant **MOSQUITO CONTROL with**

THE MODERN PULSE JET PEST CONTROL UNIT

SN. 7 SWINGFOG

The Professional Fogger

- Completely portable — Easily carried anywhere a man can walk
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- Trouble-free, quality performance at all times
- Choice of droplet size • Economical operation
- Instant Starting — No batteries or outside starting aids. *Magic Magneto Start*
- Proven — More effective control with less chemicals and effort
- All parts corrosion resistant
- Completely guaranteed

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2 WAYS YOU CAN GET MORE BUSINESS!

with new mixture for cereal equipment and grain bin fumigation

1

New Pestmaster* Spot Shot for Cereal and Food Handling Equipment is a mixture of two well-known fumigants, ethylene dibromide (70%) and methyl bromide (30%). It has excellent penetrating and killing power, vaporizes slowly, and has a distinct warning odor for added safety. It is packed in handy 1½ oz. cans to save you time, labor, and material costs. There is no waste, no bulk handling. Each can is easy to handle, provides an effective, yet economical dose. These advantages make Pestmaster* Spot Shot ideal for overnight or weekend sanitation servicing of bakeries, breweries, flour mills, feed elevators, macaroni factories, and food dehydrating plants. If you're *not* enjoying accounts like these, get Pestmaster* Spot Shot and go after them.

2

New Pestmaster* Fumigant 73 for All Bulk Grain Storages combines the same fumigants, 70% ethylene dibromide and 30% methyl bromide. Both are widely used to fumigate large-scale bulk grain buildings. Now, the advantages of each — excellent penetration and high-killing power — are combined. Pestmaster* Fumigant 73 is ideal for the treatment of localized infestations in aerated buildings or for small bins without aeration. Packed in handy 6 oz. cans for fast, labor-saving application. Pestmaster* Fumigant 73 vaporizes slowly; has a distinct warning odor for greater safety. Start fumigating bulk grain for *new profits* with Pestmaster* Fumigant 73.

For literature and application instructions on Pestmaster* Spot Shot or Pestmaster* Fumigant 73, write Agricultural Chemicals Department, Michigan Chemical Corporation. 685 N. Bankson Street, Saint Louis, Michigan

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filled and leveled, but not later than the first week in October. Apply the second surface treatment one month later, followed by subsequent treatments at 2-month intervals. To apply the wettable-powder surface treatments, use a piston-type power sprayer, equipped with agitator.

Semipermanent Anticoagulant Baits
(*from page 28*)

moval, and also prevents the container from becoming lodged in the sewer lines.

Controlling Other Rodents

Meadow mouse, *Microtus*, damage to young orchard trees with permanent cover crop was reduced using anticoagulant paraffin bait blocks. Blocks, weighing up to ½ pound, were placed at the base of the trees. In all cases, baits were well accepted and withstood varying moisture conditions involving both sprinkler irrigation and rainfall. The blocks used in the meadow mouse test contained either oat groats or rolled barley and were molded in paper cups and empty fruit cans.

House mice, *Mus musculus*, readily accepted paraffin baits containing a mixture of oat grits and canary grass seed. Baits of walnut meats, however, were more readily accepted. Ten-ounce paper cups provide satisfactory molds and hold a quantity sufficient to control a light to medium infestation of mice in a garage or basement.

Satisfactory control was obtained in tests on pocket gophers of the genus *Thomomys*, where they accepted anticoagulant rolled barley-paraffin baits in sufficient amounts. The paraffin provided adequate moisture protection. Molds consisted of paper cups and paper towel tubes. A volume of ¾ to 1 cup of bait provided the necessary amount for multiple feedings. Baits were placed in the main runways which were located with a gopher probe.

Although this type of bait does not appear to be practical for general field work due to the cost, it appears desirable in the home, yard or on school premises where safe material is needed. Efficiency of anticoagulant baits may be greatly influenced by the vitamin K content of the gopher's diet.

The advantages are two-fold: first, a more lasting bait is provided and, second, the bait cannot be readily removed by the rats. Anticoagulant paraffin bait blocks are proving helpful in controlling wood rats in mountain homes.

Experimental work is being continued and it is hoped that more uses will be found for the new anticoagulant paraffin bait block.

Black Widow Controls

To control black widow spiders, spray 1 cup of 50% wettable DDT, or ⅔ cup of 45% liquid chlordane to 1 gallon of water. These recommendations comes from Ted L. Bissell, University of Maryland entomologist.

While people are not often bitten by black widows, because they are usually timid and avoid larger creatures, they are said to be particularly vicious during their breeding season and will bite then. Bissell suggests gloves should be worn when handling flower pots, stakes or other items in flower beds, and children play pens should be checked frequently for spiders.

RAT CAFETERIA
KILLS RATS!
Feeds 1 Full Quart Of Liquid Bait And More Than 6 Pounds Of Dry Bait
• LOW COST
• CERTAIN
• SAFE
FREE AUTOMATIC LIQUID DISPENSER WITH EACH RAT CAFETERIA
"SEE IN" VISIBLE BAIT CHECK
SIZE 7 3/4 x 13 x 13

NESTED DESIGN SAVES YOU MONEY
New, slanted-side design nests 6 units to a carton. Saves 50% on freight, 50% on storage!
U.S. Patent No. 2,944,364
Today's largest-selling bait station. Approved by health authorities everywhere. Fabricated of heavy galvanized steel. Many report over 5 years of continuous use. No identification. Imprint your name.
Sample Cafeteria $3.00; Lots of 12, $2.25 ea. Lots of 48, $2.10 ea. Lots of 102, $1.95 ea. All prices F.O.B. Madison, Wis.
Write for our low prices on Warfarin Baits
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proved equipment for
PEST CONTROL and SANITATION
Make the most of your time and chemicals with service-proved equipment from Spraying Systems.
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SHUT-OFF VALVES
Use with TeeJet interchangeable orifice tips, indexing MulTeeJet tips or adjustable ConeJet tips.
SPRAY GUNS
Drip-free operation since shut-off needle extends through extension to orifice tip.
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No. 22-7676
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SPRAYERS
For permanent installation in plants. Connect to air line to operate. Plastic bottle holds chemical. Stainless steel nozzle in two or four tip designs. Single unit covers thousands of cubic feet.
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DIPHACIN 1/10 . . . Resists insects and mold resistant . . . keep attractive longer.

DIPHACIN 1/10 . . . Is packed in containers of 5 lbs. @ $1.25, 25 lbs. @ $1.15 and 100 lbs. @ 95c in 1/10% concentration, lowest concentration of all anticoagulants. One pound mixes with 19 lbs. of your formula to make 20 lbs. of ready mixed bait.

DIPHACIN 1/10 . . . Newest and most effective weapon we can employ in our "War on Rodents".

DIPHACIN 1/10 . . . Has been tested by United States Fish & Wildlife Service and United Kingdom Ministry of Agriculture, Fisheries and Food.

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FREE SUMMARY OF DATA

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Calendar

New Jersey Pest Control Assn. One Day Clinic, Dept. of Entomology, Rutgers University, New Brunswick, Aug. 21.

Tennessee Pest Control Assn. Annual Meeting, Riverside Hotel, Gatlinburg, Sept. 21-23.

Virginia State Pest Control Assn. Next tentative meeting date set for Aug. 18, 19, place to be announced.

Hawaiian Pest Control Assn. Monthly Meeting, M's Ranch House, Honolulu, Aug. 22, 7 p.m.

Ohio Pesticide Institute, Ohio Agricultural Experiment Station, Wooster, Aug. 22, 23.

Pest Control Assn. of South Florida, Banquet and Installation of Officers, Lindsey Hopkins Vocational School, Miami, Aug. 26, 6:45 p.m.

Insect Control Training Course, Communicable Disease Center, Atlanta 22, Ga., Sept. 11-22.

Professional Pest Control Assn. of Dallas County Monthly Meeting, El Chico Restaurant, Sept. 14, 7 p.m.

Alabama Pest Control Assn. Annual Meeting, Whitley Hotel, Montgomery, Sept. 15, 16.

Washington, D. C., Pest Control Assn. Meeting, 4904 Wisconsin Ave., N.W., 8 p.m., Sept. 18.

Canadian Agricultural Chemicals Assn. 9th Annual Meeting, Mont Tremblant Lodge, Mont Tremblant, Quebec, Sept. 18-20.

Alabama PCO Licensing Exam. Agricultural Bldgs., State Fair Grounds, Birmingham; Courthouse, Decatur; Courthouse, Gadsden; State Vocational School, 925 Fulton Rd., Mobile; 882 State Office Bldg., Montgomery, Sept. 19, 8 a.m.

Maryland Pest Control Assn. Monthly Meeting, Lord Baltimore Hotel, Baltimore, Sept. 20, 6:30 p.m.

Pennsylvania Pest Control Assn. Joint State Meeting, Allenberry Inn, Boiling Springs, Sept. 22, 23.

Exterminating Industry Institute, "Advertising & Marketing," National Democratic Club, New York City, Sept. 25, 8 p.m.

Rodent Control Training Course, Communicable Disease Center, Atlanta, 22, Ga., Sept. 25 - Oct. 6.

Hawaiian Pest Control Assn. Monthly Meeting, Evergreen Restaurant, Honolulu, Sept. 26, 7 p.m.

National Pest Control Assn. 28th Annual Convention & Trade Show, Deauville Hotel, Miami Beach, Fla., Oct. 15-19.

National Agricultural Chemicals Assn. 28th Annual Meeting, The Homestead, Hot Springs, Va., Oct. 29-Nov. 1.

Missouri PCO Short Course, University of Missouri, Student Union Bldg., Columbia, Nov. 6-7.

V. P. I. PCO Short Course, Virginia Polytechnic Institute, Blacksburg, Nov. 8-10.

Mosquito Control Training Course, Communicable Disease Center, Atlanta 22, Ga., Nov. 6-10.

Nebraska Assn. of Pest & Termite Control Operators, Inc. Annual Meeting and Short Course. Town House Motel, Omaha, Nov. 16, 17.

Texas Pest Control Assn. Annual Convention, Fairway Motel, McAllen, Nov. 16-18.

Ohio Pest Control Assn. Annual Meeting, Commodore Perry Hotel, Toledo, Nov. 29-Dec. 1.

Illinois Pest Control Management Workshop, University of Illinois, Urbana, Dec. 5-8.

PCOs of California, Inc. Cal-Poly Conference, Cal-Poly Institute, Pomona, Dec. 16.

Insects Cause Skin Allergies

Recognition of the importance of arthropods in man's environment as a source of inhalant allergens was described in a recent paper in the Journal of Allergy, Vol. 32, No. 2, Mar.-Apr. 1961, pp. 93-101.

Frank Perlman, MD, of the Allergy Clinic in Portland, Oregon, is author of the paper entitled, "Insect Allergens: Their Interrelationship and Differences."

Dr. Perlman reduces the groups of insects to 12 for allergists to screen for sensitivity. He uses pictures to illustrate and describe skin reactions of the various groups. The study covers inhalants, not stings or bites.

The author is credited for coining the term "multipedes" to describe millipede and centipedes. Not in the paper mentioned above, the most apt expression was used in private correspondence.

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Book Review

The Encyclopedia of the Biological Sciences

by Peter Gray, Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y., 1961. 1119 pp. $20.00.

Here is a new reference book with some 800 specially-written articles prepared by a host of authors on a host of different subjects relating to biology, biochemistry, and biophysics. Most subjects are dealt with in under 500 words. They are arranged alphabetically and are augmented by over 300 illustrations.

Rather than being a textbook, this is a marvelous addition to any scientist's library who wants a quick, brief discussion on a great many topics in the increasingly complicated field of biology. Most discussions are accompanied by a list of references to additional reading if you want to get deeper into a particular area of interest.

Of necessity, in a book of this size, the type is small as in most portable encylopedias, but it is a volume that is intended to be looked at frequently for a short time, rather than for extended study at one sitting.

Professor Peter Gray is head of Biological Sciences at the University of Pittsburgh, and has previously published numerous papers and five books on a variety of biological subjects. He is an editor of Biological Abstracts and has contributed to several other encyclopedias. For this work, he has gathered the thinking of hundreds of international authorities into one comprehensive reference. It's a storehouse of answers to a myriad of questions of interest to the natural scientist.

Ala. License Exam, Sept. 19

Examinations for anyone wishing to engage professionally in various types of pest control work in the State of Alabama, will be given September 19, at 8 a.m., in Birmingham, Decatur, Gadsen, Mobile, and Montgomery. (See Calendar on page 60) for location of examination places.)

Licensing examinations will cover control of household pests, dry rot in buildings, termites and powder-post beetles, stored-product pests, insects and diseases of lawns and sods, insects and diseases of shrubs and trees, insect pests and diseases of pecans, agricultural pests (fungal diseases), insect pests of farm animals and buildings, orchard pests, poultry pests, as well as landscape design, setting and maintenance of plants, and tree surgery. A permit fee of $10 should be paid at the time the examination is taken if applicant does not have a permit in the speciality he wishes to qualify for.

For further information, write W. A. Ruffin, supervisor, Division of Plant Industry, State of Alabama, Dept. of Agriculture and Industries, P. O. Box 220, Montgomery 1.

Resume Screwworm Fight

Distribution of screwworm flies sterilized by irradiation began in Holmes County, Fla., recently by the U.S. Dept. of Agriculture.

Other screwworm eradication operations have been intensified following the finding of about 100 larvae in a 2-week old pig on a farm in the northwestern part of the state.

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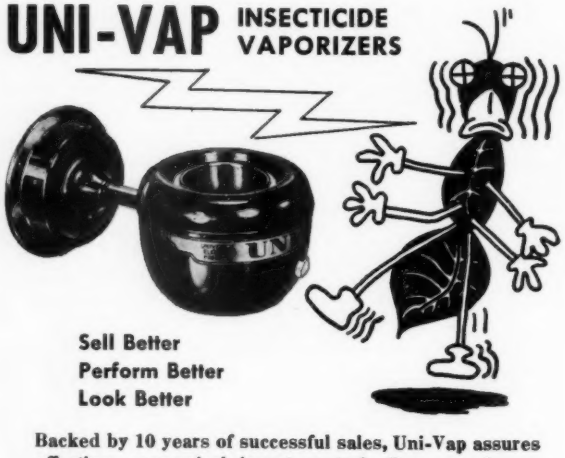

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When used as directed on label and in accordance with good practices, complies with Food and Drug Law and other Federal Laws.

THE DOW CHEMICAL COMPANY DOW Midland, Michigan

Wash. State Announces Correspondence Courses

Included in Washington State University's list of extension service correspondence courses for 1961-62 are three of interest to PCOs. Two cover "Agricultural Entomology" and the third, "Principles of Pest Control." Enrollment fees range from $36 to $48, plus cost of required texts.

For a copy of course listings, write General Extension Service, Washington State University, Pullman, Wash.

Thornton to Mich. State

New professor and head of the zoology department at Michigan State University in East Lansing, is Dr. Charles S. Thornton of Kenyon College, Ohio. He succeeds Dr. Karl A. Stiles who retired last month.

Suppliers Staff Changes

William F. Lacey has recently been appointed sales representative covering Brooklyn, Long Island, and Staten Island, New York, for S. B. Penick & Co. **F. X. McCormack** is pesticide sales rep for Penick in the South Jersey-Pennsylvania-Maryland-Delaware-West Virginia and Washington, D.C. territory.

Charles M. Gates is new southern regional sales supervisor of the Agricultural Division of Morton Chemical Co., according to an announcement made by Raymond P. Seven, assistant general manager of Morton's Ag. Div.

Maurice Oser honored at United Jewish Appeal Testimonial dinner. Here, NPCA president Oser (second from left) is presented with a special citation by Jacques J. Hess, dinner chairman, while New York PCOs Harry Rosenfeld (left) and Sidney Wimmer look on. Held in New York city's Hotel Gotham, June 14, over 50 PCO firms and suppliers were represented at the annual fund drive banquet.

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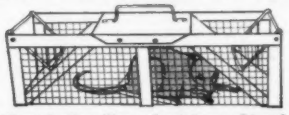

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United Chemetrics Replaces Heckathorn

United Chemetrics is the new corporate name succeeding United-Heckathorn, Richmond, Calif. chemical manufacturer. In the reorganization, the major fertilizer and airplane divisions of the company have been sold and the firm plans to expand its pesticide business. United Chemetrics' officers are Ivor R. Burden, president; Tom L. Moore, vice-president and secretary, and Philip Earl, treasurer. Headquarters are at 600 South Fourth St., Richmond, Calif.

VPI Course Nov. 8-10

1961 Pest Control Operators' Short Course, put on by the Agricultural Extension Service of Virginia Polytechnic Institute, will be held November 8-10, according to an announcement by Dr. J. O. Rowell, extension entomologist.

PCOs from Virginia and surrounding areas are invited to attend the Blacksburg educational conference. For more details, regarding registration fees and lodging, write Dr. Rowell, P. O. Box 844, Blacksburg, Va.

Seamless leak-proof canister, said to be the first of its kind, heads a list of features in a new line of gas masks being introduced by Mine Safety Appliances Co., Pittsburgh, Pa. Side and top seams reportedly have been completely eliminated. Other developments are a new harness design and a rugged plastic case claimed to be chemically inert and resistant to moisture. A threaded neck on the canister permits rapid disconnect from the breathing tube to speed replacement.

American Fluoride Moves

American Fluoride Corp. has moved to larger quarters and is now located at 855 Avenue of the Americas, New York 1, N. Y.

Notebook

TIPS AND IDEAS FROM THE FIELD

Make Every Sales Call Worthwhile

By J. EARL GRIFFIN
Aggie Chemical Co., Tulsa, Oklahoma

No matter how a prospect is developed, whether you come away with a job to provide some kind of pest control service depends upon how successfully you make that initial sales call end up in an order.

If you don't have an appointment and are calling on a homeowner because of a telephone or mail inquiry, or because of a tip someone gave you, chances are you may not find the prospect at home. If so, make the most of the opportunity you have. Leave one of your business cards, and perhaps a folder describing your service, along with a brief friendly note inviting the prospect to phone you. Some PCOs have even left sample contracts and a self-addressed, stamped envelope for the housewife to fill out and send back. But make the trip worth-

WONDER RAT BOARDS

solve difficult rat problems

A felt base with a specially prepared adhesive that is non-drying or hardening. Catches rats like flies on fly paper! Remains active indefinitely. Safe to use. No poisons required. Ideal for use in Food Plants, Warehouses, Etc.

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6″ x 6″ for mice - 9″ x 11″ for rats are usual sizes

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5 lb. Containers — 50 lb. Containers
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Sugar content makes this bait exceptionally attractive to rats and mice. Key-opening cans prevent moisture pick-up and assure long-lasting effectiveness.

Packed In

1-2/3 oz. cans. Each can makes 1 qt. (24 per case)
3-1/3 oz. cans. Each can makes 1 gal. (24 per case)
300 gram jars. Each jar makes 100 qts.

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For Your Inventory Control

Donco's special mixing process assures uniformity throughout. Only Donco offers this high quality bait at such a low price.

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4 oz. Throw Bags, 100 bags per case.
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while. Call on neighbors; the folks next door may need you, too.

When you're face-to-face with your potential customer, and have introduced yourself, start immediately to cultivate his interest. Here's what I do:

"Termites, Mr. Jones," and then I hand him a bottle of preserved or live termites. "Those are termite soldiers and workers you have in your hand, Mr. Jones. And these are flying termites," I continue, while giving him a bottle full of swarmers. In this way, my prospect is actively taking part in my sales presentation.

Then I continue with, "Have you ever been that close to termites before, Mr. Jones, or do you know someone who has to fight termites?" This will get your prospect started on his own sales talk. I use moths, carpet beetles, cockroaches, and silverfish in the same way.

Next, I follow up by showing my prospect clippings of articles from newpapers and *Pest Control* magazine which discuss industrial firms that have been sued or fined for pest filth. After he has read two or three of these, Mr. Jones is certain he doesn't want his company in the papers for the same reasons.

Or, if you're selling termite control to homemakers, you can show them pictures of other homes that have been destroyed by such wood chompers. You impress upon these folks that termites work slowly and that there's no reason to act hastily, but that to protect their biggest investment, their home, something should be done if they do have termites.

Once you've established his interest and need for pest control service, tell the prospect about your company, your service, and then ask for the order.

Offers Rodent "Key"

Copies of an illustrated chart, "Field Identification of Domestic Rodents," are available free of charge from J. T. Eaton & Co., Inc., 1106 Lakeview Rd., Cleveland 8, Ohio. The key, which shows the differences between the roof rat, Norway rat, and house mouse, was prepared by the Communicable Disease Center.

Planning Vertebrate Conference

A Vertebrate Pest Control Conference is being planned for early 1962 by government and university officials in California.

Purpose of the conference is to assemble some of the nation's experts to explain and review the most practical methods to control various non-game mammals and birds that are either a health hazard, a destroyer of man's food or fiber, or are a general nuisance.

Scheduled for February 6 and 7, at the Senator Hotel in Sacramento, Calif., the conference will be open to anyone who wants this type of information.

Arrangements for this no-host conference are being made by a California Vertebrate Pest Control Technical Committee, composed of several individuals each from the University of California, Calif. Dept. of Agriculture, Calif. Dept. of Public Health, and the U.S. Bureau of Sport Fisheries and Wildlife.

For more information, write Maynard W. Cummings, extension vertebrate pest control specialist, University of California, Davis, Calif.

Parathion Kills Two

Parathion is blamed for the death of two children and the illness of three others in Tampa, Fla., who handled a bag impregnated with the insecticide. Dr. James B. Hutcheson, Tampa pathologist, is said to have made the diagnosis after conferring with Dr. Wayland J. Hayes of the U. S. Public Health Service toxicology laboratory in Atlanta who is reported to have identified the highly toxic organic phosphate from samples of the bag. The bag had been used by the children to repair a swing.

Berlin Joins Purdue Staff

Jack Berlin, former employee of Arwell, Inc. and Vogel-Ritt in Detroit, has joined the Purdue entomology department staff to work on administration and grading of papers for the Correspondence Course in Pest Control Technology currently appearing in *Pest Control*.

Berlin, a graduate entomologist from Iowa U., will also be studying at Purdue to obtain his master's degree.

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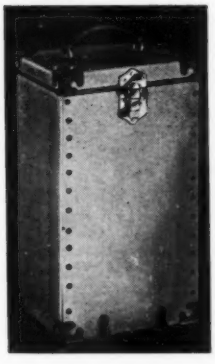

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Infestation Report

Contains pertinent portions of the Department of Agriculture's Cooperative Economic Insect Report, material from university entomology departments and reports from readers. PCOs noticing infestations in their own areas are urged to communicate with *Pest Control* so their information may be added to this infestation report.

BLACK CARPENTER ANT
(*Camponotus pennsylvanicus*)

Maryland: Winged forms abundant in and around several homes in Montgomery and Prince Georges Counties.

PAVEMENT ANT
(*Tetramorium caespitum*)

Maryland: Annoying around homes in Montgomery and Prince Georges Counties and at Baltimore. Winged forms swarming at several localities over State.

BED BUG
(*Cimex lectularius*)

California: Heavy populations in attic and annoying residents in a house in Auburn, Placer County. Also a bat problem.

CARPENTER BEE
(*Xylocopa virginica*)

Pennsylvania: Numerous reports of boring in Westmoreland County homes.

KHAPRA BEETLE
(*Trogoderma granarium*)

Mexico: Infestation found on a property in Altar, Sonora, during May. This is the first infestation found in the Republic of Mexico for 2 years.

WHARF BORER
(*Nacerdes melanura*)

North Dakota: First record of this species being abundant and a nuisance was reported from two Fargo office buildings.

AUSTRALIAN COCKROACH
(*Periplaneta australasiae*)

Montana: Infesting a home in Chester; this is a first State record.

COCKROACHES

Utah: Infestations reported in numerous homes and some motels in St. George, Washington County. A number of these infestations are *Blatta orientalis*.

DERMESTIDS

Connecticut: Larvae of *Dermestes* sp., possibly *lardarius*, burrowing into cypress panelling to make pupation chambers in Storrs. **Montana:** Various species common in many homes in State. Infestations reported from Havre, Bozeman, Polson, Helena and Butte.

EUROPEAN EARWIG
(*Forficula auricularia*)

Idaho: Infestations common and abundant around homes and in home gardens in Moscow and Troy Areas. **Utah:** More troublesome at Enterprise than elsewhere in Washington County. Annoyance over State increasing.

BLACK FLIES

Maryland: Adults annoying humans locally in Frederick County. **Minnesota:** Reported from Twin Cities area. **Rhode Island:** Many complaints of people being bitten in Warwick and Cranston areas. **Wisconsin:** Several individuals hospitalized from bites in Black River Falls, Jackson County.

MILLIPEDES

Pennsylvania: Quite numerous in homes generally in State; very abundant in southeast section.

CLOVER MITE
(*Bryobia praetiosa*)

Montana: Number one nuisance pest of State. Houses reported infested in Grass Range, Butte, Choteau, Livingston, Lewistown, Billings and Glasgow. **Nevada:** A nuisance where entering homes in Elko County.

SPRINGTAILS
(*Entomobrya unostrigata*)

Colorado: Two large apartment houses in Denver had very heavy infestations of this species annoying the tenants from 4 P.M. to 9 A.M. The infestation was confined to the south side of the building where cut grass was utilized as fertilizer in the flower gardens at the base of the buildings; this was probably a great aid in the propagation of the insects. A 99% control was obtained from two sprayings, one week apart, of 0.5% emulsifiable Chlordane solution to the infested areas.

A DRYWOOD TERMITE
(*Cryptotermes brevis*)

Virginia: Locally severe in furniture at one home at Naval Air Station, Oceana, Princess Anne County. Furniture apparently became infested when owner was in Florida.

WESTERN SUBTERRANEAN TERMITE
(*Reticulitermes hesperus*)

Montana: Houses in Glendive, Glasgow, Helena and Worden found infested.

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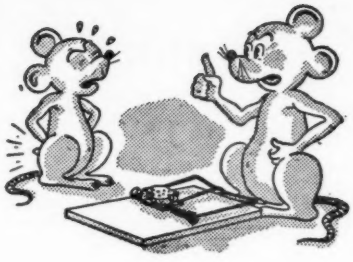

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Then put *Your Products* "On Display" through an advertisement in the

October

NATIONAL PEST CONTROL ASSOCIATION

Convention & Trade Show Issue

of

PEST CONTROL magazine

Edited for, Subscribed to, and READ by

Over 8,000*

Working, Buying Pest Controllers

using Chemicals, Equipment, Tools, and Related Supplies 12 Months of the Year

(This is a $575 Million Market!)

Your ad will be Seen (and that's what you want!) in this issue that'll feature the NPCA convention, plus business, technical, and news features, and Lesson 10 in the Purdue PCO Correspondence Course. Readers (**Your Prospects**) will keep this biggest-of-the-year issue for re-use and reference.

Every Delegate Gets a Copy

(28th annual NPCA meeting, Miami Beach, Fla., October 15-19, 1961)

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Reserve Space Now!

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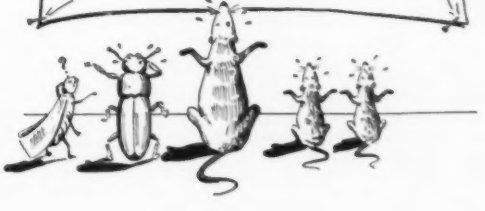
Closing Date September 20th



PEST CONTROL

The Pest Control Industry's Exclusive Monthly

How-to-do-it, Where-to-Buy-it Authority Since 1933

1900 Euclid Avenue Cleveland 15, Ohio

Classifieds

When answering ads where box number only is given, please address as follows: Box number, c/o Pest Control, 1900 Euclid Avenue, Cleveland 15, Ohio.

Rates: "Position Wanted" 5c per word, minimum $2.00. All other classifications, 10c per word, minimum $2.00. All classified ads must be received by Publisher the 10th of the month preceding publication date and be accompanied by cash or money order covering full payment.

POSITION WANTED

ENTOMOLOGIST with 10 years varied experience. Want position with challenge and furture in insecticide or pest control field. Please reply to Box 597, Pest Control magazine.

HELP WANTED

RAPID EXPANSION PROGRAM in Midwest enables us to offer qualified servicemen, salesmen and managers guaranteed salary and commission; Opportunity for advancement; permanent, year 'round employment; paid vacations, income when ill; outstanding fringe benefits including profit sharing, retirement (pension) plan; medical and surgical, hospitalization insurance, etc. Company pays all premiums. All replies held strictly confidential. Arwell, Inc., Waukegan, Illinois.

FOR SALE

WELL ESTABLISHED pest and termite control business in Central North Carolina. Nine years old, excellent reputation. Corporation with general trade name. Would make excellent "nucleus" for large company seeking expansion throughout state. Present owner-manager has other business. Box 592, Pest Control magazine.

SYNTRON self-rotating hammers. Perfect condition including bits. $125.00 for 26 Ro., $250.00 for 38 Ro. Pioneer, 200 W. 24th St., New York, N.Y.

TWO TIFA foggers @ $500 each. Completely overhauled with new fogger heads. Guaranteed top operating condition. Guarantee Exterminating Co., 4811 Carnegie Ave., Cleveland 3, Ohio.

WANTED TO BUY

GENERAL pest control business wanted. California only, or retirement plan worked out. Write Box 598, Pest Control magazine.

PEST CONTROL business in the tropics, established 1935, 14 trained employees, license available, located in largest and capitol city, grossing over $110,000 annually. Retirement reason for selling. Write Box 590, Pest Control magazine.

MISCELLANEOUS

FLORIDA dealership available Manufacturer of revolutionary new type of insecticidal fogging equipment is seeking qualified organizations for representation within the State of Florida. Write, stating lines carried and area covered. P. O. Box 246, Auburn, Indiana.

TO EMPLOYERS who advertise for men. The letters you receive in answer to your advertisements in *Pest Control* are submitted by each of the applicants with the hope of securing the position offered. When there are many applicants it frequently happens that the only letters acknowledged are those of promising candidates. (Others do not receive the slightest indication that their letters have even been received, much less given any consideration.) These men often become discouraged, will not respond to future advertisements and sometimes even question if they are bonafide. We can guarantee that Every Advertisement Printed in *Pest Control* is Duly Authorized. Now won't you help keep our readers interested in this advertising by acknowledging every application received, even if you only return the letters of unsuccessful applicants to them marked, say, "Position filled, thank you"? If you don't care to reveal your identity mail them in plain envelopes. We suggest this in a spirit of helpful cooperation between employers and the men replying to Help Wanted advertisements. Put yourself in the place of the other fellow.

Openings at N. Caro. College

Two positions are open in the entomology department of North Carolina State College. One is a combination teaching and research job in conjunction with the college's two-year course for PCOs. The other involves insect survey work as an integral part of the USDA's nationwide insect detection program.

For further information, write Dr. Clyde F. Smith, Head, Dept. of Entomology, Box 5215, North Carolina State College, Raleigh, N. C.

Drop K-Beetle Research

Victory over one of the world's worst pests of stored foods is in sight for California and possibly for the rest of the USA. That's how prospects are said to look for the federal-state-county campaign to eliminate the khapra beetle now in its 6th year in California.

David L. Lindgren, U. of Calif. entomologist at Riverside, and Cyril Gammon, program supervisor of the State's bureau of entomology, say the khapra eradication effort is so close to completion that research on the pest is being ended at Riverside.

Although successful control procedures have been developed, a relentless vigilance for foreign entry of the pest must be maintained. The beetles have been appearing in shipments of grain and grain products at Atlantic, Pacific, Gulf, and Great Lakes ports. In one year, inspectors intercepted khapra beetles 43 times at 16 different ports of entry.

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SUPPLIERS ADVERTISING IN AUGUST

Agricultural Specialties....68
Amchem Products, Inc....39
American Cyanamid Co....30
Animal Trap Co. of America....16
ArChem Corp....53
Aromatic Products, Inc....74
B & A Manufacturing Co....45
B & G Company....17, 69
Burr Chemical Co....60
Central Rubber Products Co....73
Chapman Chemical Co....15
Colonial Products Co....61
Continental Chemiste Corp....62
Cook Chemical Co....4
Donco, Inc....67
Dow Chemical Co....63
J. T. Eaton & Co....73
Fairfield Chemicals Div., FMC....3rd Cover
Geigy Agricultural Chemicals....27
Getz Exterminators, Inc....70
Great Lakes Chemical Corp....54
Clifford B. Hannay & Son, Inc. 43
Hopkins Agricultural Chemicals. 67
Hub States Chemical and Equipment Co....7
H. D. Hudson Mfg. Co....6
Kness Manufacturing Co....26
Mar-Mel Products, Inc....73
Michigan Chemical Corp....57
Mine Safety Appliances Co....43
Morton Chemical Co....18, 19
Motomco, Inc....22
Neochem Products Co., Inc....59
Norda Essential Oil and Chemical Co....41, 49
S. B. Penick & Co....51
Pest Control Equipment Co....20
Prentiss Drug & Chemical Co....8
Pyrrole Chemical Corp....29
Reinhold Publishing Co....45
Rid-A-Bird, Inc....65
Riverside Manufacturing Co....55
Shell Chemical Co....Back Cover
Solvit Chemical Co., Inc....58
Southern Mill Creek Products, Inc....56
Spraying Systems Co....58
Star Exterminating Co....65, 66
Syntron Co....44
Thompson-Hayward Chemical Co....50
Tull Chemical Co....13
United Heckathorn....64
Universal Electric Products Co..62
Universal Paper Products Co....12
Velsicol Chemical Corp....2nd Cover, 3
B. & D. A. Weisburger....65
Whitmire Research Laboratories, Inc....21
Wisconsin Alumni Research Foundation....47
Wood Treating Chemicals Co....11
York Chemical Co....65, 73

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FUMO-KILL is truly the modern method of insect extermination. Light match to contents in can, will produce fumes — NO FLAME. Non-hazardous. This amazing FUMO-KILL insecticide has been tested, and found effective against most types of household pests.

FUMO-KILL has the following advantages:

EASY TO USE: Requires no Special Equipment.

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EFFECTIVE TO USE — Follow instructions on can for best results. **This Amazing FUMO-KILL insecticide is by all qualifications, a leader in its field.**

FUMO-KILL can be obtained in 2 oz. (enough for up to 6,000 cubic feet)—4 oz. and 1 lb. cans.

Cost of 12—2-oz. Cans.....$ 7.50 per doz.
Cost of 12—4-oz. Cans.....$13.50 per doz.
Bulk.....$ 4.50 per lb.

Delivery Charges Prepaid
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MEAT - FISH - COCOANUT - MOLASSES - TOMATO

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(1) **NEW "SERVICEMEN'S SIZE KITS"** — 5 pound bags packed 2 in a carrying carton. Keeps bait fresher, easy to carry.

100 lbs.....(20-5 lb. bags).....24¾¢ lb.
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100 bags.....$9.95

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$60.00* OR MORE TRADE-IN
for any old electric hammer
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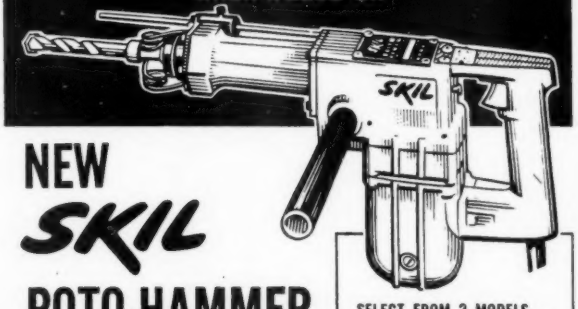

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ACTUALLY 3 TOOLS IN ONE:

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MODEL 726 (illustrated) drills masonry holes from 11/64" to 1½" diameter

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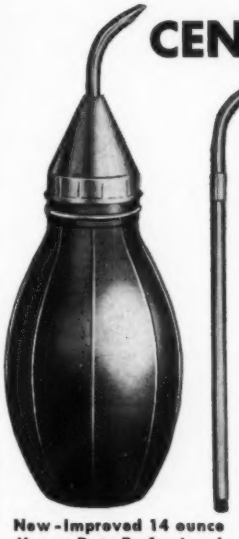

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◀ **Longer, Curved Tip**

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★ Tip 1" longer

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CENTROBULBS have largest openings for instant filling — are equipped with screens to keep particles from nozzle tips — made for heavy-duty professional work — made of best grade seamless rubber with tops made of machined die-cast zinc with removable brass tip — air-tight, with leak-proof gaskets.

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Pestales

Our Editor is concerned. Seems a story coming out of London has PC's editor a bit upset. Report is that England's Ministry of Public Works is having difficulty giving a complete bath to the statue of Lord Nelson which proudly stands before the National Gallery. Ministry officials have a pigeon-deterrent jelly which they use on the Gallery and on the lower parts of the bird-riddled statue. The compound is really effective, but Nelson's monument presents special difficulties because it's 170′ high. Since the Ministry has no helicopter, for the time being at least, Nelson's hat must remain a pigeon roost. For our editor's namesake, can't the men of Disinfestation *do* something about this? *A new hat to Mssrs Westphal, Buchan, or Farrington, whoever tells us first this state of affairs has been cleaned up.*

* * *

Turn about. **At last year's NPCA convention in Tulsa, England's Disinfestation, Ltd. sent one of its directors, E. M. Teddy Buchan, to speak on pest control in England. This year, at the firm's Rentokil Group Pest Control Conference, Norman R. Ehmann, of Neil A. Maclean Co., El Monte, Calif., spoke about pest control in California. Over 225 attended the 4-day meeting held at the Grand Hotel in Brighton by the Sea.**

Kamikaze pigeons? or bird-house missiles. The Naval Research Laboratory of Washington and the University of Minnesota are reported to have developed a model of a guided missile carrying live navigators — three pigeons. The judgments of the three trained birds are averaged to steer the nose cone. Optical images of the target are focused on three glass screens by means of lenses and mirrors. The pigeons, educated to recognize the mark, peck at its picture on each of the three disks. These are tilted one way or another, depending on the point the pigeons peck. Ballistic valves at the edges of the disks are actuated by the tilting, and steer the missle through a servo-mechanism. This is truly a bird-brained guided missile! But then we knew pigeons had built-in target pinpointers anyway. Look how accurately they *spot* a man's hat!

* * *

Something to take stock in. **News has just reached us that Orkin Exterminating Co. has filed a registration statement with the Securities and Exchange Commission covering the proposed public sale of 360,000 shares of common through Merrill Lynch, Pierce, Fenner & Smith, Inc., and Courts & Co. Here's a chance for PCOs to take stock in what their competitor is doing.**

* * *

She screams and the mouse falls dead. They build 'em hardy in Texas, even the ladies. A Houston lass wasn't scared as much by a mouse as she scared the little critter. Mrs. C., a secretary for a metal works firm, met the mouse face to face recently and let out a blood curdling scream. The mouse bit her. So, she screamed again . . . this time with more gusto than ever. It was too much for the mouse. It fell dead. Now Mrs. C. is being sought by Houston PCOs as a servicelady to work in food plants where the F&DA won't permit any toxics at all.

* * *

Graham made chief of the tribe. **Way out west in Oklahoma where men are men and the Indians still hold on to their heritage, comes the story of Big Chief Tom Graham, of Graham Pest Control in Oklahoma City. Seems the tribe in the small community of 15,000 where he lives picked Tom out to be their mayor. Now, if you're confused, wait till you read the name of his suburb: The City of the Village! But that's better than the Suburb of the Burg isn't it? Congratulations, Tom. It's quite an honor.**

* * *

Recent deaths **include the passing of J. L. Apperson, owner of Major Industries in Herrington, Kansas. He was the victim of a heart attack. Leo J. Kelly, long-time executive secretary of the National Sanitary Supply Association, died after a long illness caused by cancer. He was 64. His son, Bernard now holds the same position with the NSSA.**

* * *

Erhlich to Advisory Committee. **Chairman of the newly created Pest Control Advisory Committee to the Pennsylvania Health Department is Alex Erhlich of J. C. Erhlich & Co., Lancaster, Pa. Purpose of the committee is to act as liason between the Health Dept. and the pest control industry.**

New odor-masking agent for use in

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For safe, fast-acting insect control!

Now, with Fairfield's new DRIANONE, formulators, manufacturers and PCO's have a remarkably effective, safe residual insecticide base developed for use in critical areas where hazardous toxicants are dangerous or simply won't do.

Newest addition to the Powco line of specialty products, DRIANONE is a lab-tested, field-tested and job-tested, specially conditioned silica aerogel (Dri-Die*) with Pyrenone** added.

As a result, it is a silica dust that's easy to handle. DRIANONE, unlike others, stays put, doesn't float or cloud. For Fairfield's special conditioning process makes DRIANONE easy to apply.

Pyrenone, Fairfield's own piperonyl butoxide and pyrethrins combination fortifies new DRIANONE. It gives this highly effective residual insecticide immediate and positive insect control. It provides the fast knockdown and kill that customers prize—the action that sells.

And DRIANONE is effective over long periods of time. Stable and non-deteriorating, this specially conditioned silica aerogel is unaffected by long exposure to air, heat and light.

Together, this proved silica dust and Pyrenone form a top team. They form DRIANONE—a truly safe insecticide base proved effective against all crawling insects, resistant or otherwise. Consult your Fairfield representative today for other DRIANONE bases, Dri-Die, and Pyrenone concentrates.

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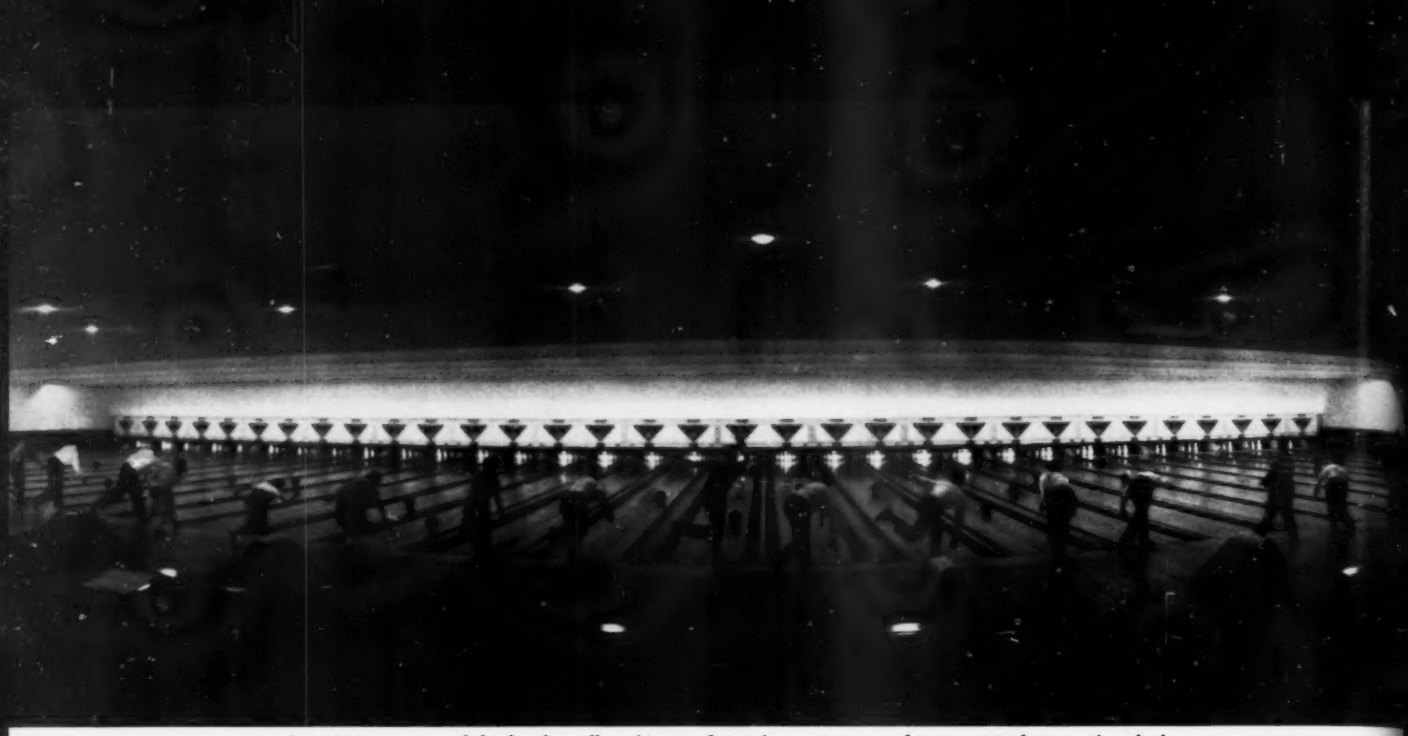

A few ounces of technical Vapona can rid this bowling alley of insects. It is safe to use—no need to stop a single game if applied as a coarse spray.

ANNOUNCEMENT:

A few ounces of remarkable new Vapona® Insecticide (technical DDVP) can make this 265,320 cubic-foot bowling alley free of annoying insects

Vapona is a new phosphate insecticide. It is highly effective against a wide range of public health insects. Very low dosages kill even resistant strains.

Read how new Vapona can be applied safely using standard equipment and techniques. And how you can start using it for more effective and economical control of insects.

New Vapona works differently than other insecticides.

In addition to killing insects on contact, it has a vaporizing effect. Insects can no longer avoid being killed by hiding in cracks, crevices and other hard to get at places.

Vapona knocks down and kills insects within a few minutes of application. Then, it disappears rapidly with ordinary ventilation.

Low cost

Vapona is applied at extremely low dosage rates. As little as ½ to 2 milligrams per cubic foot controls the toughest insects.

Because Vapona kills at such low dosage rates it is economical. It can do a better job of controlling insects for half the cost of many other insecticides.

Safe to use

Vapona offers safety in use. When applied as a coarse wet spray at recommended dosages, there is no need to wear a respirator. It is not necessary to evacuate inhabitants of homes, restaurants, stores and other public places while application is being made.

When fogging or mist spraying indoors, the building should be evacuated and the applicator should wear a respirator. Buildings should be ventilated before people are allowed to re-enter.

Vapona can be applied with all standard application equipment.

Available in 4 forms

Vapona Insecticide is available in emulsible concentrates and concentrated solutions for further dilution and in liquid and dry baits. Ask your regular supplier for Vapona Insecticide.

For more information, write: Shell Chemical Company, Agricultural Chemicals Division, 110 West 51st Street, New York 20, N. Y.

Control all these insects with Vapona

1. Flies	**8. Spiders**
2. Mosquitoes	**9. Silverfish**
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4. Flying moths	**11. Fruit flies**
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Insecticide

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